# THE IRON TRADE REVIEW

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## DANGER PASSING

### OF SERIOUS CONFLICTS OF LABOR AND CAPITAL.

### One Important Wage Scale Signed—Pig Iron Market Strong—Contracts for Structural Material and Cast Iron Pipe.

The first half of the year, which has been one of the most trying periods in the history of the iron trade, closes with some encouraging signs. Progress toward recovery, slowly but surely, has been made, and there is reason for hoping for a continuance of this progress. The prospect of avoiding serious labor conflicts is more favorable. The signing of the wage scale affecting sheet and tin plate workers and the failure of the unions to precipitate a strike on the lakes are among the indications that there is little danger of disastrous conflicts between labor and capital.

**An Important Event**

The announcement that, by the application of the Gayley dry blast to Bessemer practice, a much higher grade of steel has been obtained at the South Chicago Works of the Illinois Steel Co. is one of the most important events in the steel business in years, and promises to have large results, especially in solving vexatious problems relating to the manufacture of rails.

**Pig Iron Is Firm**

The pig iron market continues strong so far as prices are concerned, and a very fair volume of business is being transacted. The leading pump interest is in the market for 11,500 tons, and the requirements of harvester, electric and locomotive interests will demand a large tonnage. A New England consumer has closed for 12,000 tons. In the south the prevailing price is $12, although 50 cents lower has been done.

**Finished Material**

In finished lines the market is for the most part very quiet, but there is still a fair amount of contracting for steel bars. In structural material there is a disposition in some quarters, especially in Chicago, to delay placing orders, but in the New York district some contracts of good size have been closed, including the Astor Hotel addition, 3,500 tons; Astor estate building, 3,500 tons; the Sinclair Hotel, the Farmers' Loan & Trust building. It is not expected that the announcement of the erection of a 62-story building by the Equitable Life Assurance Co. will result in business at an early date.

**Cast Iron Pipe Contracts**

Cast iron pipe contracts include 2,000 tons for the city of Washington, 3,400 tons for Cleveland, and 1,800 tons for Newark, O. Cleveland officials express themselves as so well pleased with the low prices of bidders that further purchases will soon be made.

**Conditions On the Lakes**

Conditions on the Great Lakes are very unsatisfactory for vessel interests. The freight rate on ore has declined to 65 cents from ports at the head of Lake Superior, a reduction of 10 cents below last year's rate, and many boats are having difficulty in obtaining cargoes. The movement of ore to July 1 will fall about 10,000,000 tons short of that up to the same date last year. Ore is being sold very slowly.

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**A Sign of the Times.**—The N. Y. Telephone Co., which has not spent a cent this year in extensions, has ordered its engineers to rush work on estimates for large extensions to care for the expected increase in business.

## GREAT STEP

### IN ADVANCE FOR THE BESSEMER PROCESS

### Promised Through Application of the Gayley Dry Blast—Encouraging Results Obtained at South Chicago.

Results of the original application of the Gayley dry blast to Bessemer practice, here published for the first time, indicate unmistakably that a marked improvement in this steel is produced through the reduction of the moisture in the blast to a low and constant figure. That such results were to be expected had long been a contention of Mr. Gayley, and his predictions have been amply verified by the experiments carried on at the South Works of the Illinois Steel Co., where the first application of the blast was recently made at the Bessemer works, which are supplied with metal from a group of blast furnaces operating in connection with a dry air plant.

No less an authority than P. H. Dudley, of New York, well known for his work in steel rail design, rail tests and rail specifications, vouches for the success of the innovation. He finds that by the securing of a low and constant element of moisture in the air blown through the bath of metal in the converter, the ingots are noticeably free from pit marks on the sides, blow holes are confined to the extreme top and the ingot withstands rapid blooming much better than that produced by the ordinary blast.

With the lessened moisture and the more uniform steel resulting, the blooms crop with sound ends and, Mr. Dudley states, the percentage of second quality rails is materially reduced. Incidentally, the control of low or high silicon irons is enlarged and the scrap carrying capacity is considerably increased. These results, taken in connection with the securing of sound ends to the blooms, under the usual manufacturer's discard, are of extreme interest just at present in view of the possibilities they offer in connection

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# THE WEEK IN IRON CENTERS

## PITTSBURG.

### Conditions More Favorable, but Rapid Improvement Not Expected.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., June 30.

The beginning of the second half of the year finds the iron and steel industry in an improved position. The situation has been clarified by the elimination of several influences which, whether or not their presence had actually restrained an increased trade, had unquestionably furnished the means for keeping the market in a state of uncertainty. Principal among these was that of price reductions. These have come in due season in response to the demands of buyers and in accordance with the ruling judgment among makers. Beyond some division of opinion as to whether the cut in several products has been adequate, there now remains little opportunity for differences in this respect between manufacturers and consumers. Certainly there is less expression of doubt as to the stability of the present level of quotations and more confidence that the readjustment, in the main, has been completed.

The market clearly has a more favorable outlook. Buying for the first half has been close to real needs and stocks, throughout the country, held over from the beginning of the depression, have generally been absorbed by the trade. The railroads, which have kept their purchases at the lowest possible ebb, are showing signs of awakening interest and are expected to increase their orders in the near future. Generally there is a disposition among manufacturers to take a fresh hold upon the situation and to more actively co-operate in an effort to reclaim prosperity. It is the belief among conservative interests, however, that while business may gradually improve, no decisive recovery may be anticipated before the closing months of the year.

The turning point into the second half is naturally a time for slowing down temporarily, and the past week has been an especially quiet one, with the exception of steel bar material. The estimate is officially made that since June 2, the date of the reduction in bars, 650,000 tons of bar mill products, including steel bars, hoops, bands, small shapes, etc., have been placed under contract with the different makers throughout the country, including old contracts rewritten at the reduced price. With some companies the annual inventory period is at hand, the Republic Iron & Steel Co. having temporarily closed its mills for that purpose.

An important development of the week has been the signing of the annual sheet and tin wage scale between the American Sheet & Tin Plate Co. and the Amalgamated Association of Iron, Steel and Tin Workers. A reduction of 2 per cent to the sheet and 6 per cent to the tin workers is brought into effect by this agreement.

**Pig Iron.**—The striking feature of the pig iron market the past week has been its extreme dullness. With the end of the first half and the annual inventory season for many companies at hand, there is apparent a disposition on the part of uncovered consumers to defer buying until some later date. It appears clear, however, that prices are firm at the present level.

A sale of interest has been that of 6,000 tons of foundry iron to an eastern enameled ware manufacturer for delivery over the last half at plants in Connecticut and western Pennsylvania. The iron did not go to a valley interest, but was taken on a basis of about $15 valley for that portion of it coming to this territory. A fair run of small orders for foundry iron for quick shipment was closed in the week. A steam pump interest is inquiring for a round tonnage.

The Bessemer market shows a surprising spread in prices, according to reported sales. A local steel foundry this week bought 200 tons for prompt shipment at less than $16 valley, which has been regarded as the bottom price. The sale is understood to have been made at $15.75 valley. The transactions with equal delivery conditions are also reported at $16.25 valley.

Basic is stationary. A sale of 100 tons was made at $15.50 valley. There is some inquiry for malleable and the range of the market is from $15 to $15.50 valley. Forge is held at $14 valley.

The Shenango Furnace Co. will put in its No. 1 stack on basic, July 8.

For prompt and third quarter delivery, we quote as follows, the higher quotation on Bessemer iron being for chill cast:

| | |
|---|---|
| Bessemer, valley | $16.00 to 17.00 |
| Bessemer, Pittsburg | 16.90 to 17.90 |
| No. 1 foundry, Pittsburg | 16.15 to 16.40 |
| No. 2 foundry, Pittsburg | 15.90 to 16.15 |
| Gray forge, Pittsburg | 14.90 to 15.15 |
| Basic, valley | 15.25 to 15.50 |
| Basic, Pittsburg | 16.15 to 16.40 |

**Ferro-Manganese.**—The ferro-manganese market is less active, but a number of small sized transactions are being put through regularly at the quoted prices. There is some inquiry from local foundrymen. Higher prices are being asked by some dealers in ferro-silicon, but there are no sales. We quote 80 per cent ferro-manganese, for prompt and future shipment, at $44 to $45 Baltimore, and $45.95 to $46.95 Pittsburg.

Imported 50 per cent ferro-silicon is quoted $70 Pittsburg on forward deliveries; domestic 12 per cent, $29; 11 per cent, $28; 10 per cent, $27. The lower grades of imported ferro-silicon are upon about the same basis. These quotations are applicable to Pittsburg territory.

**Plates.**—No improvement is shown in plates, and the activity continues at a low mark. The 1.60c price is being shaded by some of the independent mills, sellers stating that their quotations at the official rate are being rejected by some customers as being too high in competition. We quote:

Tank plate, ¼-inch thick, 6¼ to 100 inches, 1.60c f. o. b. mill Pittsburg. Extras are as follows per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in width over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

**Sheets.**—A greater demand for corrugated roofing sheets is noted, due to numerous building contracts being placed. Beyond this sheet conditions are unchanged. We quote:

Black steel sheets, cold rolled, No. 28 gage, 2.50c per 100 pounds, and galvanized sheets, No. 28 gage, 3.55c

per 100 pounds, plus the regular extras.

Blue annealed: Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c. Corrugated roofing, $1.75 per square for No. 28 painted, 2½-inch corrugation; and $3.10 per square on galvanized roofing, 2½-inch corrugation, No. 28.

**Tin Plate.**—No signs of diminution of the tin plate trade are shown, and the mills continue to operate at practically full schedules. We quote:

Coke tin plate, 100-pound basis, 14 x 20, $3.70 f. o. b. mill Pittsburg district. Terms, 30 days, less 2 per cent for cash in 10 days.

**Rails and Track Material.**—Some of the railroads under contract are specifying more heavily for rails. In light rails, the month of June is about the best of the present year for the local maker. Low prices are being named on light rails to meet the competition of rerollers. Mills 1 and 2 of the Edgar Thomson works are operating at less than 50 per cent capacity, and mill No. 3 is still idle. On present specifications on Bessemer rails we quote as follows:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $36; 12-pound, $32; 16-pound, $30; 20-pound, $29; 25 to 45-pound, $28; angle splice bars for standard sections, $1.65; standard spikes, $1.70 to $1.80 Pittsburg; hand spikes, $1.80 to $1.90 Pittsburg.

**Steel.**—The semi-finished steel market has made no response to the price reductions. Billets are lifeless and sheet and tin bars are quite active, as they have been for some time. Holders of sliding scale contracts for billets based on the average price for Bessemer iron, are gaining practically no advantage at the market prices now in force. In sheet bars, however, these contracts are enabling their possessors to obtain their material at about $1 under the $27 Pittsburg price. We quote:

Bessemer and open-hearth billets, base sizes, $25 Pittsburg, and forging billets at $27 Pittsburg, subject to the division of the freight charge over $1 and not exceeding $3, and sheet and tin bars at $27.50 Pittsburg, valley and Wheeling territory, and $27 Pittsburg for delivery to other points.

**Hoops, Bands and Cotton Ties.**—The hoop and band market is comparatively active, and considerable tonnage is moving. This market has been consistently good for some time. Cotton ties are now moving from warehouses. We quote the following official prices:

Cotton ties, 85c per bundle Pittsburg, plus the freight on lots of 3,000 bundles or more, and 88c per bundle Pittsburg for less than 3,000 bundle lots.

Hoops in carload lots, 1.80c; in less than carload lots, 1.90c; bands, 1.40c, base half extras as per standard steel.

**Merchant Bars.**—It is officially stated that fully 650,000 tons of bar mill products have been placed under contract in the country, since the reduction in bar material was announced June 2. This includes business taken in steel bars, hoops, bands, small shapes, implement and vehicle steel, etc. A major portion of the material is for a year's delivery, from July to July, and much of it is from the trade outside of the agricultural implement and vehicle interests. The railroads are showing an awakened interest in bars, and other products which go to rolling stock repairs, and some heavy inquiries are in the market. These are not expected to be closed, however, until after July 1, which marks the ending of the railroads fiscal year. Bar iron business is light. The Republic Iron & Steel Co. has closed its mills for its annual inventory and operations will be discontinued for two or three weeks. There is considerable business in horseshoes being taken, and the Shoenberger plant of the American Steel & Wire Co. in this city which has been idle for several months, resumed this week. Shafting is quiet. We quote as follows:

Common iron bars, 1.40c Pittsburg in carload lots and over; 1.45c in less than carloads; 1.32c to 1.35c base Pittsburg plus freight to point of shipment on western deliveries; Bessemer steel bars, 1.40c; plow and cultivator, 1.40c; channels, angles, zees, tees, under 3 inches, 1.50c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting 56 per cent in carloads and 52 per cent in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. Planished and machine straightened tire steel is 1.80c base. Iron finished tire under 1½ by 1½ inches, 1.75c; iron finished tire, 1½ by 1½ inches and over, 1.60c. All tire subject to ½ extra on the steel card.

On cold rolled strip steel, width 1½ inches and wider and 0.100 inch and thicker, we quote base prices per 100 pounds, $3.60 on hard and $3.75 on soft.

**Structural Material.**—The business of the leading fabricator and erector, in June, was about the lightest of the present year. Little business is coming from the railroads, and it is not expected much work of this sort will appear before the close of the present season. The structural mills at Homestead have very full schedules this week. Fabricators continue to take work at low prices. The new 12-story May building in this city, soon to be erected, will require 700 tons, and the new iron mill of A. M. Byers & Co. at Girard, O., will take about 500 tons. We quote:

Beams and channels, 15-inch and under, 1.60c; over 15 inches, 1.70c; zees, 1.60c; tees, 1.65c; angles from 3 to 6 inches, 1.70c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

**Merchant Pipe.**—Although a normally quiet season in merchant pipe is at hand, it is expected that the trade over the next several months will not show much falling off from the present basis. About 50 per cent of capacity represents mill operations on merchant pipe at this time. Oil field goods are moving actively, and some of the large independents in this district are working full in their lapweld departments, with good prospects for continuing at this gait into the last quarter. It is reported that a local gas interest has just closed for 44 miles of 12-inch pipe for line pipe work in West Virginia. We quote the following official base discount to consumers in carloads, with an additional one point and five off to jobbers:

| | —Steel— | | —Iron— | |
|---|---|---|---|---|
| | Black. | Galv. | Black. | Galv. |
| ¼ to 6 inches.... | 75 | 65 | 73 | 63 |

**Boiler Tubes.**—The boiler tube market, as is to be expected, is slow to recover from the business stagnation. Railroads are buying only for renewals, and business with boiler makers is not heavy. We continue to quote the following discounts:

| | Iron. | Steel. |
|---|---|---|
| 1 to 1½ inch..... | 42 | 47 |
| 1¾ to 2¼ inch..... | 42 | 59 |
| 2½ inch ..... | 47 | 61 |
| 2¾ to 5 inch..... | 52 | 65 |
| 6 to 13 inch..... | 42 | 59 |

2½ inches and smaller, over 18 feet, 10 per cent net extra.

2¾ inches and larger, over 22 feet, 10 per cent net extra.

**Wire Products.**—An improved tone is shown this week in wire products. More confidence as to the stability of present prices is apparent, and it is expected by producers that a considerable improvement in trade will be noted by the end of July. We quote as follows:

Wire nails, jobbers' carload lots, $1.95; retailers' carload lots, $2; painted barb wire, jobbers' carload lots, $2.10; retailers' carload lots, $2.15 with 30c for galvanizing; plain wire to

jobbers in carloads, 1.80c; and to retailers in carloads, 1.85c.

**Wire Rods.** — The outlook in wire rods is better and more business is in prospect. We quote $33 Pittsburg on Bessemer and $34 Pittsburg on open-hearth rods.

**Coke.**—The coke business is holding its own fairly well. There is considerable contracting under way in both foundry and furnace grades and present prices appear to be well upheld. The prevailing contract prices are $2.25 for foundry and $1.85 for furnace, standard coke being considered. Some furnace sales are reported at $1.90. The harvester interests are taking more than their full monthly installments on contract, indicating the active condition of their business. We quote standard Connellsville foundry coke at from $2.15 to $2.25 ovens and standard Connellsville furnace coke at from $1.65 to $1.85 ovens, the lower quotations being for prompt shipment. The *Courier* for the week of June 13 to 20, reports 15,340 active and 22,035 inactive ovens with a production of 162,404 tons compared with 15,306 active and 22,053 inactive ovens and 162,947 tons, the previous week.

**Old Material.**—The situation in old material is changing but little. Dealers are finding difficulty in securing tonnage to fill current orders as production is small and holders of scrap are disinclined to accept present prices. The offerings of the railroads this month are very small. The Pittsburg Steel Co. continues to collect old material, principally heavy melting stock and is now estimated to have at least 15,000 tons in its yards. We quote nominally, gross tons delivered in the Pittsburg district as follows:

Heavy melting scrap, $13 to $13.50; rerolling rails, $14.50 to $15; bundled sheet scrap, $9.50 to $10; iron axles, $19 to $20; old iron rails, $16 to $17; No. 1 wrought scrap, $13.25 to $13.75; old car wheels, $13 to $13.50; low phosphorus, $17.50 to $18; machine shop turnings, $8 to $8.50; cast borings, $7.50 to $8; No. 1 cast scrap, $13.75 to $14.25.

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The Touhill Iron Works, Scranton, Pa., recently completed the casting of a pulley wheel 16 feet in diameter, with a 5-foot face, weighing 27 tons. When turned, bored and key-seated this wheel will be shipped with two 6-foot pulleys, 5-foot face, weighing five tons each to a British Columbia concern.

## CHICAGO.

### Further Contracting for Steel Bars—Market Generally Quiet.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, June 30.

Quietness prevails in all departments of the market with the exception of steel bars, in which the buying activity continues moderately. The leading interest contracted for an additional 10,000 tons during the past week. Pig iron is less active, though a fair tonnage was sold. Prices are less firm and keen competition brings out a shading of the prices that were firm a fortnight ago, particularly for prompt shipment iron. A somewhat improved demand for billets is noted and specifications against contracts for rail fastenings are in good volume. Structural steel contracts seem almost impossible to close, though pending for some time, because of the prevalence of the belief that lower prices are inevitable. From many viewpoints, however, the outlook is for a continuance of the present prices throughout the summer and an increasing confidence in the resumption of business during the latter months of the year is still apparent. Mill operations are entering into the midsummer period of idleness and this dullness is reflected in the condition of the scrap market. Reports from different parts of this territory indicate that the number of men returning to work is very surely increasing, though some of the hiring of employes is only for intermittent periods.

**Pig Iron.**—Desultory trading in pig iron is the rule in this market. One lot of 1,000 tons of malleable iron and a lot of 500 tons of southern silvery were purchased. Several other 500-ton lots were purchased, but consumers are displaying practically no eagerness to buy; in fact, the slowness of the buyers in placing orders is proving a strong temptation to shade prices in competition. In all, the better part of 10,000 tons was disposed of in this territory. The price for fourth quarter iron is $12.50 for No. 2 southern at Birmingham and $17.50 to $18.00 for northern iron. For third quarter and the last half, where deliveries begin at once, the same prices are $12 and $17.50. For prompt or immediate shipment furnaces are willing to take $11.75 for southern No. 2 and $17 for northern. No business is being allowed to go to furnaces outside of this territory and in consequence even $17 might be shaded where necessary. As yet no disposition has been shown upon the part of consumers to hold up shipments. It is somewhat early to predict what will happen during July, when a considerable quantity of iron will be moved, but the strength of the market for prompt shipment iron at least will depend upon the willingness of the consumers to accept shipments.

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|---|---|
| Lake Superior Charcoal | $19.50 to 20.00 |
| Northern Foundry No. 1 | 17.50 to 18.00 |
| Northern Foundry No. 2 | 17.00 to 17.50 |
| Northern Foundry No. 3 | 16.50 to 17.00 |
| Southern Foundry No. 1 | 16.85 to 17.35 |
| Southern Foundry No. 2 | 16.35 to 16.85 |
| Southern Foundry No. 3 | 15.85 to 16.35 |
| Southern Foundry No. 4 | 15.35 to 15.85 |
| Southern No. 1 Soft | 16.85 to 17.35 |
| Southern No. 2 Soft | 16.35 to 16.85 |
| Southern Gray Forge | 14.35 to 14.85 |
| Southern Mottled | 15.10 to 15.60 |
| Southern Silveries, 4 per cent Silicon | 17.85 to 18.35 |
| Southern Silveries, 5 per cent Silicon | 18.35 to 18.85 |
| Southern Silveries, 6 per cent Silicon | 19.35 to 19.85 |
| Jackson Co. Silveries, 6 per cent | 18.90 to 19.40 |
| Jackson Co. Silveries, 8 per cent | 20.90 to 21.40 |
| Jackson Co. Silveries, 10 per cent | 22.90 to 23.40 |
| Malleable Bessemer | 17.00 to 17.50 |
| Standard Bessemer | 18.25 to 18.75 |
| Alabama Basic | 16.35 to 16.85 |

**Billets and Rods.**—Specifications on billet contracts are more active and plentiful and one shipment of 1,000 tons was specified during the past week. The inquiry for small billets by the local horseshoe manufacturer has not been placed, the interest holding out for prices considerably lower than have been quoted. It is understood, however, that a portion of the steel, at least, must be bought in the near future. There is little interest outside of the necessary transactions in wire rods. Prices are well supported in this market and we quote re-rolling billets $26.50, and forging billets $28.50, base Chicago. We quote, f. o. b. Pittsburg, Bessemer wire rods, $33; open-hearth, $34; and chain rods, $33.

**Plates.**—Material in such quantities as are required for immediate use on a small scale is being bought with fairly routine regularity, but no buying in lots of individual importance or in quantities indicating anything like an increased demand for plates is reported. The universal mill at the South Works of the leading producer was started this week, but its activity during the summer, like that of the other mills of this and other plants, will be more or less intermittent. We quote for Chicago delivery as follows:

Plates, ¼-inch and heavier, 6¼ to 100 inches wide, either universal or sheared, 1.78c Chicago. For extras see Pittsburg report. Jobbers' prices for shipment from local stocks are as follows: Tank steel, ¼-inch and heavier, up to 72 inches wide, 2c to 2.10c; from 72 to 96 inches wide, 2.10c to 2.20c; 3/16-inch up to and including 60 inches wide, 2.10c to 2.15c; 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.10c to 2.15c. Flange and head quality, 25c extra.

**Sheets.**—Mill activity in sheets is at

a low ebb and there is little more animation in the movement from jobbers' stocks. Buying is in much reduced quantity, prices are none too securely held, and purchases are for immediate requirements only. We quote prices for delivery from local stocks as follows. For mill prices see Pittsburg report.

No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; Nos. 18-20, 2.60c to 2.65c; No. 22-24, 2.65c to 2.70c; No. 26, 2.70c to 2.75c; No. 27, 2.75c to 2.80c; No. 28, 2.85c to 2.95c; No. 30, 3.25c. Galvanized sheets, No. 10 to 16, 3.05c to 3.15c; Nos. 18 to 20, 3.15c to 3.25c; Nos. 22 to 24, 3.30c to 3.35c; No. 26, 3.50c to 3.55c; No. 27, 3.70c to 3.75c; No. 28, 3.90c to 4.00c; No. 30, 4.40c to 4.50c.

**Structural Steel.**—The policy of delaying the placing of contracts for structural material is again making itself felt in this market and at least 20,000 tons on which bids have been sent in for some time are being held up, with the time of their placing indefinite. But little more material was placed this week than last, the total tonnage being confined to a few hundred tons of which no single order reached 100 tons. The Chicago & Northwestern railroad is in the market for 2,000 tons of steel for miscellaneous bridge work. It is also reported that a Minnesota ore road has ordered 1,000 steel ore cars, but this cannot be confirmed. Certainly the cars are not required for immediate service. The attitude of the mills indicates a prospect for prices well maintained at the present quotations. We quote as follows:

Beams and channels, 3 to 15 inches, inclusive, 1.78c to 1.81c delivered Chicago. For extras see Pittsburg report. Quotations from store are as follows for carload lots and over:

All angles, 3 inches and larger, including 6 inches, $1.95 per 100 pounds; angles over 6 inches, $2.05 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $1.95 per 100 pounds, base; channels, 3 inches and larger, $1.95 per 100 pounds, base. Less than carload lots are $1 a ton higher than foregoing prices.

**Rails and Track Supplies.**—Reports to the effect that the Great Northern railroad has ordered large quantities of track supplies seems, from evidence obtainable in this market, to be without foundation. The specifications on contracts for track fastenings were very good during the week, however, as were also the inquiries and orders. The Pennsylvania Steel Co. took contracts for a considerable quantity of special street railway track work and has in prospect of speedily closing several thousand tons of traction rails. Interest in standard sections is almost wholly wanting and it is pretty well established that there will be no additional buying of rails in connection with preparations for moving the fall crops. We quote as follows:

Standard rails, $28 f. o. b. mill, full freight to destination; light rails, 25-pound to 45-pound, $28; 20-pound, $29; 16-pound, $30; 12-pound, $31. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; spikes, 1.80c to 1.90c; track bolts, with square nuts, 2.20c to 2.25c; with hexagon nuts, 2.35c to 2.40c. Small railroad and square boat spikes, 1.90c base, f. o. b. Chicago.

**Merchant Bars.**—The buying of steel bars continues and an order for 10,000 tons was placed with the leading producer which brings its total taken together with the 52,000 tons already on the books up to 62,000 tons. In a smaller way other mills are also receiving specifications for bars and the buying is developing proportions somewhat in excess of the conservative estimates predicted. There appear to be no departures from the schedule price of $1.40 Pittsburg. Hard steel bars are being held firmly at $1.30 Pittsburg, but are moving only in moderate volume. Bar iron is very quiet. We quote:

Bar iron, 1.50c to 1.53c; soft steel bars and bands, 1.58c, half extras; soft steel angles, less than 3 x 3, 1.68c; hoops, 1.98c base, full extras; planished or smooth finished tire steel, 1.78c; iron finish, up to 1½ x ½ inch, 1.73c base tire card; iron finish, 1½ x ½-inch and larger, 1.58c base steel card; channel for solid rubber tire, ¾ to 1 inch, 2.08c, and 1⅛-inch and larger, 1.98c; smooth finished machinery steel, 1.83c; flat sleigh shoe, 1.63c; concave and convex sleigh shoe, 1.83c; cutter shoe, 2.05c; toe calk steel, 2.13c; railway spring, 1.93c, base steel card; vehicle spring steel, 1.98c base, vehicle card; crucible tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 56 per cent off the list for carload lots, and 52 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stocks, we quote as follows: Bar iron, 1.90c to 2c, full extras; soft steel bars, $1.80 per 100 pounds base, plus half extras; soft steel hoops, 2.30c, full extras.

**Cast Iron Pipe.**—The day on which this report was written brought more inquiries to the leading cast iron pipe interest in this territory than any previous day of the year. This was largely for small lots, but the aggregate volume was very satisfactory. The contract for 1,800 tons of 6 and 8-inch pipe for Newark, O., was taken by J. B. Clow & Son. Orders were taken by the United States Cast Iron Pipe & Foundry Co., for about 2,000 tons of gas pipe and the contract for 1,200 tons of pipe for Berwyn, Ill., which has been let to contractor, will doubtless go to the same interest after the 10 days' bonding period. Prices continue firm and we quote for Chicago delivery as follows: 4 to 6-inch pipe, $27; 6 to 16-inch, $26; larger sizes, $25; gas pipe $1 a ton higher.

**Merchant Pipe and Boiler Tubes.**—Following the reductions in prices, an improvement in tonnage of tubular goods moved has been noted and as the reductions were favorably received, they are taken to have been responsible for the increased business. There is no buying for the future, however, and the amount necessary for immediate consumption is, of course, limited.

We quote mill discounts, Chicago delivery, carload lots, as below. On steel pipe jobbers are allowed a concession of one point and 5 per cent additional from the schedule in force.

| | —Steel— Black. | Galv. |
|---|---|---|
| ¾ to 6 inches, inclusive..... | 73.2 | 63.2 |
| 7 to 12 inches, inclusive..... | 70.2 | 55.2 |

| BOILER TUBES. | Steel. | Iron. | Seamless. |
|---|---|---|---|
| 2¼ to 5 in., inclusive.... | 63.2 | 50.2 | 50.2 |

Mill quotations on iron pipe are three points higher than the foregoing prices.

We have revised our prices from store, as below. A concession of one-half to one point from these prices is allowed by Chicago jobbers on carload orders shipped from local stocks. We quote for less than carload lots as follows:

MERCHANT PIPE.

| | —Steel— Black. | Galv. |
|---|---|---|
| ⅛ to ¼ inch..... | 65 | 49 |
| ⅜ inch ..... | 67 | 53 |
| ½ inch ..... | 69 | 57 |
| ¾ to 6 inches..... | 73 | 63 |
| 7 to 12 inches..... | 69 | 54 |

Store prices for wrought iron pipe, carload lots, from Chicago stock, are as follows: One-eighth to ¼-inch, 61c; ⅜-inch, 63; ½-inch, 65; ¾-inch to 6 inches, 70; 7 inches to 12 inches, 67. Boiler tubes from store are unchanged.

**Wire Products.**—No transactions tending to change the aspect of the market with respect to wire goods have transpired. The trade is generally very quiet, but the favorable feature is apparent that the situation both from the standpoint of stocks

of manufactured material still unsold and the extent to which needs of consumers are unfilled is more than ordinarily propitious. We quote for Chicago delivery as follows:

Wire nails, $2.13; painted barb wire, $2.28; galvanized barb wire, $2.58; smooth annealed wire, $1.98; smooth galvanized wire, $2.28; polished staples, $2.23; galvanized staples, $2.53. Carload lots to retailers, 5 cents higher; less than carload lots, 15 cents higher.

**Coke.**—The immediate prospect of two furnaces blowing in in this district will be a welcome addition to the consuming power for coke. One of these stacks will operate on by-product coke and it is understood that coke for the other has already been contracted for. Foundry operations are not greatly increased, which fact limits the current demand to moderate proportions. Prices remain at the level at which they have stood for several weeks past and we quote Connellsville foundry coke at $2.25 and furnace coke at $1.90 to $2, f. o. b. the ovens.

**Old Material.**—The weakness of the scrap market becomes increasingly pronounced. There is practically no trading save for the buying up of the railroad scrap offered and offers of various grades of scrap by dealers at reduced prices fail to move any of their large stocks. The shutting down of mills, added to the fact that they are entering on a period of idleness with some stocks of scrap on hand, does not strengthen the situation. The railroad offerings included 1,000 tons by the Chicago, Milwaukee & St. Paul, 3,000 tons by the Chicago, Burlington & Quincy and 2,150 tons by the Chicago & Northwestern. It is understood that the greater part of this was absorbed. We have revised our prices, but concede these prices to be weak at the levels quoted. Gross tons are quoted in the first paragraph.

| | |
|---|---|
| Old car wheels | $13.00 to 13.50 |
| Old iron rails | 15.50 to 16.00 |
| Re-rolling rails (3 ft. and over) | 14.00 to 14.50 |
| Old steel rails (3 ft. and under) | 12.50 to 13.00 |
| Light section relayers, 45 lbs. and under, subject to inspection | 21.00 to 23.00 |
| Relaying rails, subject to inspection | 19.00 to 19.50 |
| Frogs, switches and guards | 11.75 to 12.25 |
| Heavy melting steel | 11.50 to 12.00 |

We quote, net tons, as follows:

| | |
|---|---|
| No. 1 R. R. wrought | $12.00 to 12.50 |
| No. 2 R. R. wrought | 11.00 to 11.50 |
| Knuckles, couplers and springs | 11.50 to 12.00 |
| Shafting | 14.50 to 15.00 |
| Iron car axles | 16.50 to 17.00 |
| Steel car axles | 15.00 to 15.50 |
| Dealers' forge No. 1 | 9.50 to 10.00 |
| Pipes and flues | 8.25 to 8.75 |
| No. 1 cast, 150 lbs. and less | 12.00 to 12.50 |
| No. 1 mill | 7.00 to 7.50 |
| Mixed busheling (Nos. 1 and 2) | 7.00 to 7.50 |
| Country sheet | 4.50 to 5.00 |
| No. 1 boiler cut | 8.00 to 8.50 |
| Boiler punchings | 10.00 to 10.50 |
| Cast borings | 4.50 to 5.00 |
| Mixed borings, etc | 4.50 to 5.00 |
| Machine shop turnings | 5.50 to 6.00 |
| Railroad malleable | 11.25 to 11.75 |
| Agricultural malleable | 10.25 to 10.75 |
| Stove plate and light cast scrap | 10.25 to 10.75 |
| Old iron splice bars | 14.25 to 14.75 |

## CLEVELAND.

### Slow Ore Movement—Cast Iron Pipe Bought by the City.

Office of THE IRON TRADE REVIEW, Browning Building, June 30.

**Iron Ore.**—Ore shipments for the season up to July 1, 1907, amounted to 12,685,625 tons and it is probable that the movement for the present season, up to July 1, will fall short about 10,000,000 tons. Vessel capacity to move more than 700,000 tons of ore has been contracted for on the basis of 65 cents from ports at the head of Lake Superior, a reduction of 10 cents below last year's rate and 5 cents below the rate reported last week. It seems probable that no contracts will be made below 65 cents, although an occasional cargo may be carried at 60 cents, a rate which it is generally conceded is very unprofitable for the vessel interests. Some ore is being put on docks, although there is little room for it. The movement to furnaces is very slow. Many of the ships are unable to get cargoes at upper lake ports. The labor unions are not in a belligerent mood and a strike on the lakes at any time in the near future is not now expected. The selling of ore is proceeding slowly.

On base ores, with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70, and Mesabi non-Bessemer, $3.50.

**Pig Iron.**—A fair number of sales for moderate tonnage is reported, and prices are well maintained. Considering all conditions, pig iron is remarkably strong. For Cleveland delivery we quote as follows:

| | |
|---|---|
| Bessemer | $16.90 to 17.10 |
| No. 1 foundry | 16.00 to 16.50 |
| No. 2 foundry | 15.75 to 16.00 |
| No. 3 foundry | 15.50 to 15.75 |
| No. 2 southern | 16.35 |
| Gray forge | 14.50 to 15.00 |
| Lake Superior charcoal | 19.50 to 20.00 |

**Coke.**—There has been a fair demand for foundry coke and some inquiries of good size are pending. We quote $1.75 to $1.80 at the oven for furnace coke, and $2.25 for high grade foundry coke.

**Finished Material.**—Some additional contracts for steel bars have been made. Nearly all lines are extremely quiet. G. H. Brooks & Co. were awarded the contract for 200 tons of structural steel for the new Plain Dealer building. The contract for the Sterling & Welch building has not yet been awarded. Eastern bar iron manufacturers are still making very low quotations and selling in the Cleveland territory at 1.40c delivered.

Two bids were received by the board of public service of Cleveland, June 29, for 3,400 tons of cast iron pipe, 240 tons of special and miscellaneous castings, and a third bidder appeared for special castings alone. The United States Cast Iron Pipe & Foundry Co. bid $77,350 for all sizes of pipe, from 3 to 36 inches inclusive; $10,391.50 for special castings delivered on the streets, and $1,860 for miscellaneous castings, the total being $89,601.50. The Massillon Iron & Steel Co., Massillon, O., bid for all sizes of pipe, $75,860; for special castings, $11,000, and miscellaneous castings, $3,200; a total of $90,060. In awarding the contract to the United States Cast Iron Pipe & Foundry Co., the board called attention to the fact that the bid of that company covered delivery on the streets where needed, and estimated the cost of hauling the pipe and castings at 60 cents a ton. The cartage of the entire tonnage would be $2,184, which, added to the pipe bid of the Massillon Co., would bring its bid and cartage cost up to $92,244. This made the Pipe & Foundry company's pipe bid at the rate of $22.75 a ton, and the Massillon company's bid, f. o. b. at mill, at $22.31 a ton, or delivered on Cleveland streets, $22.95 per ton. The Semisteel Co. bid for 3 to 16-inch special castings $43 a ton. This bid was accepted. The Pipe & Foundry company and the Semisteel company both bid $65 a ton for the 20 to 36-inch special castings, and the Massillon company $55 for the same castings. The Massillon company, however, stipulated that this price was only for carload lots. Since only 59 tons of these castings are estimated as needed for the next six months, the award was made to the United States Cast Iron Pipe & Foundry Co.

**Old Material.**—There is little demand for material and the shipments the past week have been in small tonnages, steel being more of a feature. The local mills together with other steel and iron bar mills in this locality are prepared for the usual summer shut-down, and small quantity of old material is being stored in addition to what is already on hand. We quote the following, f. o. b. Cleveland, unchanged from last week.

| | |
|---|---|
| Old iron rails | $15.00 to 15.50 |
| Old steel rails (re-rolling) | 13.00 to 13.50 |
| Old steel rails (under 6 ft.) | 13.00 to 13.50 |
| Old car wheels | 12.75 to 13.25 |
| Old steel boiler plate | 11.50 to 12.00 |
| Steel axles | 17.00 to 18.00 |
| Malleable iron (railroad) | 12.00 to 12.50 |

| | |
|---|---|
| Malleable iron (agricultural) | 10.00 to 10.50 |
| Heavy steel | 12.50 to 13.00 |
| Country mixed steel | 11.00 to 11.50 |
| Low phosphorus | 15.50 to 16.50 |

We quote, net tons, as follows:

| | |
|---|---|
| No. 1 R. R. wrought | 12.50 to 13.00 |
| No. 1 busheling | 11.00 to 12.00 |
| No. 1 machine cast | 11.50 to 12.50 |
| Iron axles | 17.00 to 18.00 |
| Axle turnings | 9.00 to 9.50 |
| Machine shop turnings | 6.50 to 7.00 |
| Grate bars | 9.00 to 10.00 |
| Pipes and flues | 10.00 to 10.50 |
| Tank iron | 10.00 to 10.25 |
| Hoop and band iron | 6.50 to 7.50 |
| Sheet iron | 4.25 to 5.25 |
| Wrought drillings | 6.50 to 7.00 |
| Stove plate | 10.50 to 11.00 |
| Cast borings | 5.50 to 6.00 |

## NEW YORK.

### Important Inquiries For Pig Iron.—Numerous Structural Contracts.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., June 30.

**Pig Iron.**—The current market presents a curious contrast to that of a few weeks ago, in that inquiries now pending are almost entirely for large amounts, with a very general absence of the small inquiries which have been a feature of the recent buying movement. The International Steam Pump Co., which originally asked tenders on iron for delivery running over a year only to find furnaces unwilling to quote, has modified its inquiry and is now ready to close on some 4,500 tons for relatively early shipment to its plants at Holyoke, East Cambridge and Elmwood Place. In addition, it will require about 7,000 tons for its Harrison works. The General Electric Co. is in the market for 1,500 tons of low phosphorus iron and 500 tons each of high and medium silicon for its Lynn works. The leading locomotive interest has been inquiring for additional iron in good quantity. A New England consumer closed recently for 12,000 tons on which a price of $16.50 delivered was reported, but it develops that this was practically No. 2 plain iron. One southern interest is offering on the basis of $11.50, Birmingham, but other producers are holding firm. Low prices are being made by two or three northern interests, which are taking the bulk of the business. A quiet market is expected during the hot season, though the undertone is healthy. We quote, tidewater delivery, third quarter shipment, as follows:

| | |
|---|---|
| Northern foundry No. 1 | $16.50 to 17.00 |
| No. 2X foundry | 16.00 to 16.50 |
| No. 2 plain | 15.50 to 16.00 |
| No. 2 southern foundry | 16.00 to 16.50 |
| Malleable | 17.50 to 18.00 |
| Basic | 15.00 to 15.50 |
| Gray forge | 15.25 to 15.75 |

**Ferro-Alloys.**—A sale of close to 400 tons of ferro-manganese is reported at $44, seaboard, with some other moderate inquiries current. Consumers in this territory are in the market for lots of ferro-silicon aggregating 150 tons, on which the current price for 50 per cent is about $70, Pittsburg. Silicon-spiegel is quotable at $38, seaboard, for 10 to 12 per cent; silico-manganese (20 per cent silicon and 50 per cent manganese) at $90; and spiegeleisen at about $31.

**Finished Materials.**—Structural lettings in this vicinity during the week have not been numerous. The Astor hotel addition will be erected by J. B. & J. M. Cornell, about 3,500 tons being required. The Astor estate building nearby, also about 3,500 tons has gone to Post & McCord. The Hay Foundry has the contract for the Sinclair hotel site building and the Farmers' Loan & Trust building, 1,700 tons, will be erected by Levering & Garrigues Co., of Lackawanna steel. Two small bridge contracts have gone to the Pennsylvania Steel Co., one for the Long Island and the other for the New Haven system. The filing by the Equitable Life Co. of plans for a 62-story building covering an entire down town block is not expected to result in early business.

The sale of 12,000 tons of rails to the receivers of the Seaboard Air Line by the Maryland Steel Co. is reported. There is considerable inquiry in rails for export, notably one lot of 1,400 tons of 50-pound sections for shipment to Honolulu.

A large amount of cast iron pipe will be contracted for shortly for the improvement and extension of the water supply in Greater New York, for which heavy appropriations have been provided. A letting of about 2,800 tons is booked for July 8. The 2,000-ton contract for the city of Washington went to the Lynchburg works.

Some fair sized billet inquiries are pending and limited sales have been made at the official price. On finished steel material, a slightly better demand is noted, and prices are being well maintained, though there is some cutting by small producers on steel bars. We quote:

Angles, 3 to 6 inches x ¼-inch and heavier, 1.76c; beams, 3 to 15 inches, 1.76c; tees, 3 x ¼-inch and heavier, 1.81c; plates, carloads, tanks, 1.76c; marine boilers, 2.16c; bar iron, 1.41c; soft steel bars, 1.56c; sheets, No. 28, black, 2.66c.

**Old Material.**—The scrap market is without feature. Mills are buying sparingly and prices are about stationary. Little improvement is noted in consumption and there are still large accumulations in the hands of the larger dealers. We quote, gross tons, New York delivery, as follows:

| | |
|---|---|
| Old iron rails | $14.00 to 14.50 |
| Old steel rails, re-rolling | 14.00 to 14.50 |
| Relaying rails | 20.00 to 21.00 |
| Old car wheels | 12.00 to 12.50 |
| Old iron car axles | 16.00 to 16.50 |
| Old steel car axles | 15.00 to 15.50 |
| Heavy melting steel | 10.50 to 11.00 |
| No. 1 railroad wrought | 13.50 to 14.00 |
| Iron track scrap | 12.00 to 12.50 |
| Wrought pipe | 9.00 to 9.50 |
| Cast borings | 6.00 to 6.50 |
| Wrought turnings | 7.50 to 8.00 |
| Heavy cast scrap | 12.50 to 13.00 |
| Railroad malleable | 9.00 to 9.50 |
| Stove plate | 9.00 to 9.50 |
| Grate bars | 9.50 to 10.00 |

## CINCINNATI.

### No Substantial Evidence of Cutting of Pig Iron Prices.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., June 30.

**Pig Iron.**—Business the past week has continued quiet, with just about sufficient inquiry and order placing to sustain interest in the market. There has been, however, more business closed and there is more tonnage pending than in the preceding week, which was unusually dull. A sale of 600 tons No. 2 northern, prompt shipment iron to an Ohio melter was reported at $15 Ironton. Two lots of gray forge, one of which was a 500-ton order, sold at $10.75 Birmingham, which confirms the reported strength in this grade. A Michigan melter bought 500 tons by analysis on the basis of $12 Birmingham. There is an inquiry from a local melter for 2,000 tons of foundry iron for last half delivery. An Indiana melter is in the market for 5,000 tons, of which 3,000 tons is standard Bessemer. An eastern consumer is asking for prices on 5,000 tons and in northern Ohio an inquiry for 1,000 tons of foundry iron for last half delivery is under consideration. There are a number of smaller tonnages under negotiation, with some call for malleable. Considerable of the inquiry has developed as a result of circularizing and salesmanship, but in spite of the fact that selling agencies have been more energetic during the week, prices appear to have been maintained. While the market has the appearance of weakness, this may be attributable to some extent to a laxity in applying analysis specifications to grades, as a close canvass of the situation fails to locate any southern furnace quoting less than $12 Birmingham through this market or any northern furnace going below $15 Ironton for No. 2 foundry. There are intimations of price shading, but no substantial evidence is obtainable of sales at lower prices than current quotations. Jackson County silvery is firmly held at $18.50 at furnace for 8 per cent. But

few requests to hold up shipments are coming in and some melters are asking that iron due in July be hurried forward. We quote for prompt shipment and third quarter, delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton as follows:

| | PER TON |
|---|---|
| Southern foundry No. 1 | $15.75 to 16.25 |
| Southern foundry No. 2 | 15.25 to 15.75 |
| Southern foundry No. 3 | 14.75 to 15.25 |
| Southern foundry No. 4 | 14.25 to 14.75 |
| Southern No. 1 soft | 15.75 to 16.25 |
| Southern No. 2 soft | 15.25 to 15.75 |
| Southern gray forge | 13.75 to 14.00 |
| Northern No. 1 foundry | 16.70 to 17.20 |
| Northern No. 2 foundry | 16.20 to 16.70 |
| Northern No. 3 foundry | 15.70 to 16.20 |
| Northern 8 per cent silicon | 19.70 |

**Finished Material.**—There have been fair specifications on contracts and a fairly good tonnage of shafting is under consideration, but new business in the way of mill orders has been light. Retail business is fair, with prices well maintained. Orders from stock are billed here at the following quotations:

Iron and steel bars, 1.85c to 2c, full extras. Angles, 3 x 3 and over, 2.10c to 2.25c; beams and channels, 15 inches and under, 2.10c to 2.25c; small angles and architectural channels, 2c base; plates, ¼-inch and heavier, 2c; 3/16-inch, 2.10c; No. 8, 2.15c; sheets (blue annealed) No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; box annealed sheets, Nos. 18 and 20, 2.55c to 2.65c; Nos. 22 and 24, 2.65c to 2.75c; Nos. 25 and 26, 2.70c to 2.80c; No. 27, 2.75c to 2.85c, and No. 28, 2.85c to 2.95c; boiler tubes, 2¾ to 5 inches, 62 per cent off base; turnbuckles, 45 per cent off; rivets, 3c base; cold rolled shafting, 47 to 50 per cent off list; steel tire, 2.05c to 2.10c base.

**Coke.**—Business is on a moderate scale and but few contracts are pending. Spot coke is in ample supply, but dull. Prices are apparently well maintained, and ovens are showing less disposition to accept business for the first half of next year at present prices, which is making it more difficult to bring consumer and producer together. Quotations in the leading coke producing districts on contracts are as follows:

| | PER TON |
|---|---|
| Wise county furnace coke | $1.60 to 1.85 |
| Wise county foundry coke | 2.10 to 2.25 |
| Pocahontas furnace coke | 1.75 to 1.85 |
| Pocahontas foundry coke | 2.00 to 2.25 |
| Standard Connellsville foundry coke | 1.85 to 2.00 |
| Standard Connellsville foundry coke | 2.25 to 2.40 |
| Connellsville district furnace coke | 1.60 to 1.80 |
| Connellsville district foundry coke | 2.00 to 2.25 |

**Old Material.**—Prices are not quotably changed and the market rules quiet, although there is some inquiry from rolling mills. We quote dealers' prices to melters as follows.

| | |
|---|---|
| Old No. 1 R. R. wrought, net tons | $11.00 to 12.00 |
| Cast machine and fdy., net tons | 12.00 to 12.50 |
| Old iron rails, gross tons | 13.50 to 14.00 |
| Old steel rails (re-rolling) gross tons | 12.75 to 13.25 |
| Old short lengths, gross tons | 12.00 to 12.50 |
| Old iron axles, net tons | 15.50 to 16.50 |
| Heavy melting scrap, gross tons | 12.00 to 12.50 |
| Stove plate, net tons | 9.50 to 10.50 |
| Wrought turnings | 5.00 to 6.00 |
| Cast borings, net tons | 4.00 to 4.50 |
| Car wheels, gross tons | 13.00 to 14.00 |

The product of the Ironton Iron Co., the new furnace at Ironton, is being offered for last half delivery, and some sales have been made.

## PHILADELPHIA.

### Fair Volume of Sales of Pig Iron—Finished Lines Quiet.

Office of THE IRON TRADE REVIEW, 408 Central Trust Bldg., June 30.

**Pig Iron.**—There has been no essential change in this market during the past week. While the buying is not quite so active as it was some three weeks ago, it still continues in fair volume and, compared with the slim tonnages that prevailed so long, must be considered very satisfactory. An especially gratifying feature is that the great majority of producers decline to make any concessions. Most of the orders are in rather small amounts, from 50 to 200 tons, but occasional orders of 500 to 1,000 tons come along, and some big consumers are in the market for large amounts. The pipe founders, who seem to have felt the business depression less than any other class, are always on the lookout for cheap irons. Orders for the last quarter are generally taken at an advance of 50 to 75 per cent over prevailing prices, which show little change, as follows:

| | |
|---|---|
| No. 1X foundry | $17.00 to 17.50 |
| No. 2X foundry | 16.50 to 17.00 |
| No. 2 plain | 16.00 to 16.50 |
| Standard gray forge | 15.25 to 15.50 |
| Basic | 15.25 to 15.50 |
| Low phosphorus | 21.00 to 21.50 |
| No. 2 Birmingham | 16.25 to 16.75 |
| No. 2 Virginia | 16.75 to 17.25 |

**Finished Material.**—No marked improvement is noticeable in the demand, especially as regards iron bars and structural material. Steel plates are reported to be in better shape, but conditions as a whole are quiet. This is not unusual, of course, for this season of the year, when so many of the mills close down for repairs. The Alan Wood Co. mill at Ivy Rock, which has been closed for three weeks, is to start again next Monday. Quotations remain unchanged, as follows: Structural material, 1.75c to 1.90c, according to specifications; steel plates, 1.75c to 1.80c; refined iron, 1.30c to 1.35c; steel bars, 1.50c to 1.55c.

**Old Material.**—While the market continues quiet, the demand, especially from the bar mills, has been sufficient to advance prices in several lines. Quotations follow:

| | |
|---|---|
| Old steel rails | 15.00 to 15.50 |
| No. 1 steel scrap | 13.50 to 14.00 |
| Old steel axles | 18.00 to 18.50 |
| Old iron axles | 20.00 to 20.50 |
| Old iron rails | 17.25 to 17.75 |
| Old car wheels | 13.50 to 14.00 |
| Choice scrap R. R. No. 1 wrought | 15.75 to 16.25 |
| No. 1 yard scrap | 13.50 to 14.00 |
| Machinery scrap | 13.50 to 14.00 |
| Low phosphorus scrap | 18.00 to 18.50 |
| Wrought iron pipe | 12.50 to 13.00 |
| No. 1 forge fire scrap | 11.50 to 12.00 |
| No. 2 forge fire scrap, ordinary | 9.00 to 10.00 |
| Wrought turnings | 10.00 to 10.50 |
| Axle turnings, heavy | 11.00 to 11.50 |
| Cast borings | 9.25 to 9.75 |
| Stove plates | 11.00 to 11.50 |

## BUFFALO.

### Contract for New State Educational Building Awarded.

Office of THE IRON TRADE REVIEW, 932 Ellicott Square, June 30.

**Pig Iron.**—Prices are fairly well maintained, though there is selling below quoted figures and some of the larger interests are letting the business go by the board rather than try to meet the competition. Sales are not plentiful at all, but small orders are being taken for third quarter and some for last half delivery. Encouraging news comes from the railroad supply houses and an awakening is looked for in that field in the not distant future. The stored stock of one furnace in western New York, which was quite large, has been reduced to almost nothing. We quote as follows f. o. b. Buffalo:

| | |
|---|---|
| No. 1X foundry | $16.50 to 17.00 |
| No. 2X foundry | 16.00 to 16.50 |
| No. 2 plain | 15.50 to 16.00 |
| No. 3 foundry | 15.00 to 15.50 |
| Malleable Bessemer | 16.00 to 17.30 |
| Gray forge | 15.00 to 15.50 |
| Charcoal | 20.25 to 20.75 |

**Finished Materials.**—The R. T. Ford Co., Rochester, N. Y., has been awarded the contract for the erection of the new state educational building at Albany at their bid of $3,022,282. Over 12,000 tons of steel are involved. Specification on orders has picked up in nearly all lines during the past week, while small orders continue a feature. The sale of 1,000 tons of galvanized sheets for extended delivery is noted.

## ST. LOUIS.

### Fair Inquiry for Pig Iron—Observations Concerning Coke.

June 29.

**Pig Iron.**—St. Louis dealers reported quite a fair bunch of inquiries in their mails this morning, with a satisfactory aggregate tonnage, although there was not much business of consequence last week. Prices remain the same, $12 to $12.50 for No. 2 Birmingham for immediate and future shipments. Furnaces report enough iron on hand to prevent stocks from accumulating in the south. In the

Hanging Rock district (Ohio), where furnaces have mostly been accumulating stocks, one company has about 25,000 tons of iron. A speedy buying movement it is estimated would take care of the estimated make of the last several months. Our quotations, delivered, to which the $3.75 freight from Birmingham has been added, follow:

| | |
|---|---|
| No. 1 southern | $16.25 to 16.75 |
| No. 2 southern | 15.75 to 16.25 |
| No. 3 southern | 15.25 to 15.75 |
| No. 4 southern | 14.75 to 15.25 |

**Coke.**—One St. Louis firm reports an order for 600 tons of Connellsville furnace coke, this morning, for delivery over the year, and inquiries were out last week for 300 to 400 cars of foundry coke for shipment from July to July, which probably will be placed this week. The market on foundry coke continued firm, without change in prices. The best 72-hour Connellsville foundry coke is quoted at $2.15 to $2.50 a ton, ovens, for immediate and future delivery; 48-hour Connellsville furnace, $1.50 to $2, and Virginia and West Virginia, the same as last report. The freight rate on coke is $2.80 to East St. Louis, $2.90 to St. Louis, and $2.40 when destined beyond.

President Alex Yule, of the DeCamp Bros. & Yule Iron, Coal & Coke Co., returned Saturday from an extended trip through the east for the purpose of investigating the coke situation. He was in Pittsburg several days, and reports that most of the coke producers are not inclined to sell for next year's delivery at present, and some few are willing to make contracts at an advance of 15 to 25 cents on the ton over existing quotations for deliveries over the last half of the present year. About 20 per cent of the ovens are in operation, he says, and several companies have issued instructions for several ovens to get in shape to fire up, so that within the next 10 days or two weeks there should be about 60 per cent of the ovens going. About 60 per cent of the men in the coke districts have returned to their native countries, and it is estimated that a good many of them will stay abroad; so that, by the time many more ovens are in working order there will be a shortage of coke workers. Mr. Yule further reports that about 40 per cent of the steel mills are in operation and others are getting ready to put additional furnaces to work.

**Old Material.**—Scrap iron men seem to be more hopeful, although there has been a decline in some articles recently. Our quotations follow:

| | |
|---|---|
| **Cast iron borings, free from foreign material, net ton** | **$ 4.50** |
| **Steel axle turnings, net ton** | **8.00** |
| **Steel railroad axles, net ton** | **13.50 to 14.00** |
| **Iron railroad axles, net ton** | **15.50** |
| **Miscellaneous steel scrap, gross ton** | **9.75** |
| **Old car wheels, gross ton** | **14.00 to 14.50** |
| No. 1 railroad cast scrap, net ton | 10.50 |
| Heavy machinery cast, net ton | 11.50 |
| Stove plate and light cast, net ton | 9.00 |
| Sheet iron, net ton, uncut | 3.00 |
| No. 1 railroad wrought, net ton | 10.00 to 10.50 |
| Railroad malleable, net ton | 11.00 |
| **Heavy melting steel, net ton** | **10.00** |

## BRITISH IRON MARKET.

### Dullness of Pig Iron Continues, But Prices Are Maintained.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., June 20.

Nothing has occurred to relieve the persistent dullness in pig iron. In the Cleveland district, the week has been extremely quiet, with very few transactions. Indeed, it is wonderful how, with so little business doing, prices are maintained. The reason seems to be that the make of No. 3 pig iron has been so reduced as to barely meet requirements. Consequently, stocks have this month been reduced by 7,561 tons. Shipments continue fairly large, especially for German destinations. The scarcity of No. 3 has led to the use of some Lincolnshire and Northampton brands by Cleveland consumers. There are no stocks of East Coast hematite, but business is not strong, and mixed quotations continue at 57s ($13.94). The standard yesterday for No. 3 was slightly lower, being 50s 10d ($12.44), with 50s ($12.24) for three months; but there is now very little forward buying. The same is substantially true in the Birmingham district, where there have been hardly any sales this week. Northampton has been selling here at the very low price of 44s ($10.76), and South Staffordshire forge at 45s ($11.2). The foundry department is rather a useful standby, especially in the steel department, several works of which are very busy. The most was made by pig iron venders of a reported order placed with the Stanton Iron Works, Ltd., for 300,000 tons of cast iron pipes which would have stimulated pig iron. The true dimensions of this order turned out to be 3,000 tons. Some stocking is going on in this district, but the amount is not formidable.

---

Colonel J. A. Andrews, of the Newport, Ky., Rolling Mill Co., is quoted as saying that the company is satisfied with the present wage arrangements with its employes, and expects to renew the wage scale which expired June 30.

## GERMAN IRON MARKET.

### Demoralization in Pig Iron and Worse Conditions Expected.

Dusseldorf, June 15.—The situation here remains very depressed and although the commencement of the third quarter of the year is very near, no contracts have yet been made for delivery for July to October. Works have so very little to do that they are rather anxious to get into the time during which they take up their year's account, i. e., from the first to middle or even end of July. It is now certain that our pig iron syndicates will not be renewed at the end of the year, and thus the pig iron producers will become free to sell their pig iron from Oct. 1 for delivery to start from Jan. 1, 1909. A very wild struggle between our pig iron makers will then set in and it is easily to be understood that such a prospect cannot improve the situation. As soon as the pig iron is not sold any longer by the intermediary and control of a syndicate, this will also influence the position of our "Stahlwerksverband" and the general opinion here is that this institution cannot long be maintained. Some very optimistic people have had the idea of forming a general German pig iron trust, comprising the sale and control of the whole German pig iron production, but such an idea is unworkable here, as the interests of the different districts are too different.

In the meantime, prices are still unchanged in the inland and the ruinous sales abroad continue. A great number of not mixed works have shut down their works, as it is impossible for them to keep their works going on account of the scarcity of orders and the ruinous prices. The great mixed works have still more to do, but they only live from export orders, which leave little or no profit. An illustration for this is the fact, that one of our biggest works, viz., the Phoenix Co., which last year gave a dividend of 17 per cent, will this year give only about 7 per cent, i. e., for the time from July 1, 1907, to July 1, 1908.

Our bank rate is now 4½ per cent and whilst daily money can be obtained in London now at 1 per cent less, we have to pay for it in Berlin 3½ per cent and even up to 4 per cent. It is evident that this dear money must prevent any improvement.

# METAL MARKET

## NEW YORK.

June 30.

**Copper.**—The market continues at a practical standstill and prices, though nominally maintained, are tending lower. London trading has shrunk to limited proportions and the domestic market has been dull in sympathy. We quote: Lake, 12⅞c to 13c; electrolytic, 12¾c to 12⅞c; casting, 12½c to 12⅝c.

**Pig Tin.**—Consumers are showing little interest in the market and transactions are so light that prices are sagging. Spot tin can be had at about 27¼c, New York.

**Pig Lead.**—In the absence of any considerable buying, prices have shaded off slightly and the current level is 4.45c to 4.50c, New York.

**Spelter.**—The situation is weaker, although prices are still nominally unchanged, 4.45c to 4.50c, New York.

**Antimony.**—We quote: Cookson's, 8⅝c to 8¾c; Hallett's, 8½c to 8⅝c; ordinary brands, 8c to 8¼c.

## CHICAGO.

June 30.

Prices during the past week have not changed and in metals the trading movement has been dull. We quote as follows:

Lake copper, 13½c to 14c; casting, 13¼c to 13½c; pig tin, 32c to 32½c; spelter, 5.10c to 5.25c; pig lead, desilverized, 4.60c to 4.75c in 50-ton lots; corroding, 4.75c to 4.85c in 50-ton lots; car lots, 2½c per 100 pounds higher; sheet zinc, 7c list, f. o. b. LaSalle, in car lots of 600-pound casks; Cookson's antimony, 11c to 11½c; other grades, 10c to 10½c.

Some improvement in the prices of old copper, brass and lead has been in decided contrast to the falling off in tin, pewter and zinc. Activity is not much increased. We quote prices to dealers as follows:

Copper wire 11c; heavy copper, 11c; light copper, 10c; heavy red brass, 10c; heavy yellow brass, 8¼c; light brass, 5½c; No. 1 red brass borings, 8c; No. 1 yellow brass borings, 7½c; brass clippings, 8c; tea lead, 3½c; lead scrap, 3¾c; zinc, 3c; tin pipe, 20c; tin foil, 16c; pewter, 3c; electrotype plates, free from wood, 14c; electrotype dross, 2¾c; stereotype plates, 4½c; stereotype dross, 3¼c; prime slab zinc, $55 per ton.

## ST. LOUIS.

June 29.

**Lead and Zinc.**—Lead and zinc sustained stiffened prices last week, zinc going to the high price of $37.50 a ton and lead reaching a mark of $65.50 in the bin. The assay base price for zinc was $35 a ton, and there was little ore sold under a $33 base, thus bringing the average to a high price. The majority of sales of lead were at $64 a ton. The necessity for pumping water out of the mines has developed a new factor. The cost has materially multiplied within the last year, and quite a number of mines ceased operations Saturday night, thus further restricting the output.

## UNIQUE PROPOSAL

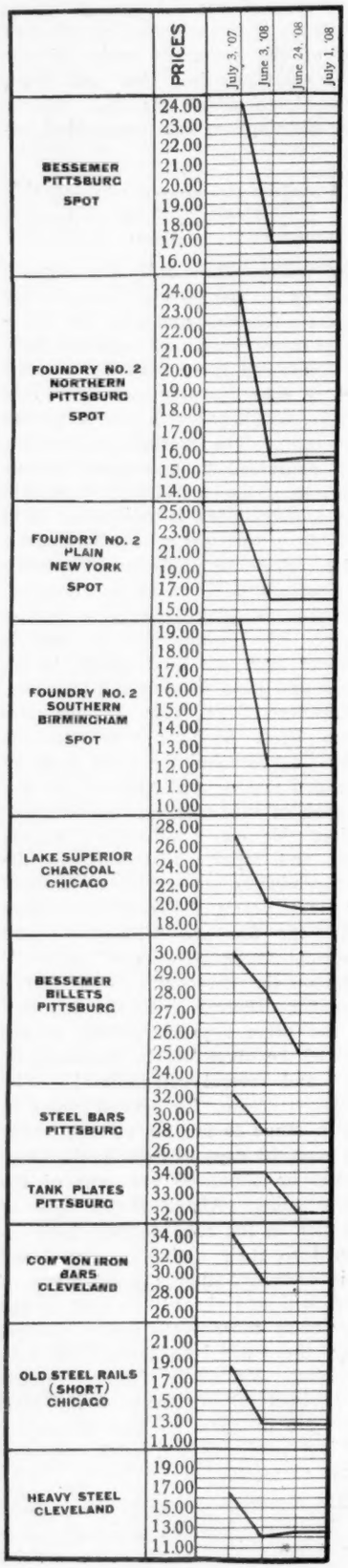
### To Limit Possible Damages Rejected by Dominion Iron & Steel Co.

At the annual meeting of the shareholders of the Dominion Iron & Steel Co. at Montreal, on June 25, President J. H. Plummer put before them the proposals of the Dominion Coal Co., respecting the litigation between the companies. The proposition was to the effect that the appeal against the decision of the Canadian courts in favor of the steel company awarding it damages for breach of contract should go on before the imperial privy council, at London, but that an arrangement should be effected limiting the damages in advance of the decision; the coal company agreeing to pay $1,250,000 to the steel company if the decision be in the former's favor, on condition that if the steel company be successful it should not get more than $2,000,000 damages, with an alternative proposal fixing these amounts at $1,500,000 and $1,750,000, respectively. In either case the future price of coal supplied the steel company to be $1.50 per ton for slack, and $1.80 for run-of-mine, the coal company guaranteeing to supply 25 per cent of slack.

President Plummer reported strongly against accepting these proposals and was sustained by the meeting, which unanimously voted to reject them. A resolution was adopted authorizing the directors to increase the common stock by $5,000,000, and to issue $20,000,000 consolidated bonds to be applied for retiring the existing bond issue and providing for the floating debt improvements and extensions.

The Bridgeport Brass Co., Bridgeport, Conn., is arranging to build a tube mill on Housatonic avenue to relieve the congestion of its other plant. The structure will be brick and steel construction, 160 x 400 feet.

## PRICE CHART.



## WAGE SCALE

### Affecting Steel and Tin Workers Has Been Signed.

After a conference at Pittsburg extending over several days, the annual wage scale affecting sheet and tin workers, has been signed by representatives of the American Sheet & Tin Plate Co. and the Amalgamated Association of Iron, Steel and Tin Workers. The 1907-1908 scale expired at midnight Tuesday, and the new agreement is now in effect until June 30, 1909.

The new scale provides for a 2 per cent reduction from the present schedule for sheet workers. It also stipulates that all members of the sheet crew shall be paid upon a tonnage basis. Heretofore, only part of the crew worked under such conditions.

In tin plate a 6 per cent reduction was conceded by the association, applying to all classes of workmen except the heaters, who will continue under the same schedule in force during the past year. It is expected that since no conferences have been asked for, the independent sheet and tin plate manufacturers whose plants are unionized, will accept the agreement with the American Sheet & Tin Plate Co. without further deliberation.

The wage agreement affecting the bar mill men between the Republic Iron & Steel Co. and the Amalgamated Association, expired at midnight Tuesday without any new scale having been signed. This development has not produced any definite results at this particular time, since the mills of the Republic are now idle, having been closed Friday for their annual inventory. Before they shall have resumed operations, the second conference between the Amalgamated and the Western Bar Iron Association will have been held at Detroit, July 7. The results of this meeting will probably have a strong bearing upon the future relations between the Republic and the Amalgamated in their present controversy.

## CAST IRON PIPE FOR GREATER NEW YORK.

(Special Telegram.)

New York, July 1.—Indications now are that, before the close of the summer, New York City and adjacent boroughs will have placed contracts for close to 100,000 tons of cast iron pipe. Specifications are ready on a large lot of 48-inch and Brooklyn has appropriated $2,000,000 to improve its service. It will close shortly on 30,000 tons. Manhattan will reuire probably 40,000 tons and Staten Island about 20,000 additional.

## PERSONALS.

Benjamin Nicoll, of B. Nicoll & Co., New York, sails Thursday for a six weeks' trip abroad.

August Marx, general manager of the Philadelphia Roll & Machine Co., will leave early in July for a sojourn of several months in Europe.

Claire L. Barnes, sales manager of the Detroit Steel Products Co., has resigned to accept a like position with the Billings-Spencer Co., Hartford, Conn.

J. L. Cooper, president of the J. C. Russell Shovel Co., Pittsburg, suffered serious injuries, including a broken leg, by being thrown from his carriage in a runaway accident in Pittsburg, June 27.

Professor Carl P. Thomas, instructor of marine engineering at Cornell University for four years, will sever his connection with the university at the close of the college year to become teacher of experimental engineering at the University of Wisconsin.

E. H. Gary, chairman of the United States Steel Corporation, sails for Europe on Tuesday of next week. W. E. Corey, president, will return about July 17. James Gayley, first vice president, sailed this week on the Oceanic, having a number of other steel men as companion passengers.

Robert Hadfield, a member of the Hadfield family, well known in the iron and steel business in England, with many friends in the industry in Pittsburg, Philadelphia and New York, where he has visited, has been knighted by King Edward of England. He is an ex-president of the Iron and Steel Institute.

George D. Evans, assistant manager of sales at the Cleveland offices of the Republic Iron & Steel Co., has resigned his position on account of his health, his resignation to take effect July 1. Mr. Evans will leave at once for Colorado Springs, and he expects to spend several months roughing it on the Colorado mountains.

Warren F. Perry, secretary to Manager Thomas McDonald, of the Youngstown district of the Carnegie Steel Co., has resigned his position and been elected secretary of the Job Iron & Steel Co., Ashland, Ky. Mr. Perry will take up his new work July 1. He had been connected with the Ohio works for the past seven years. He will be succeeded by his assistant, H. J. Little.

Joseph G. Butler Jr., chairman of the Bessemer Pig Iron Association, will leave July 2 on the Hamburg-American line steamer Amerika to spend two months in London, Paris and Berlin. He will be accompanied by Mrs. Butler, as well as his grandson, John Willard Ford. In Mr. Butler's absence, Robert Bentley, of the Ohio Iron & Steel Co., will look after the affairs of the Bessemer Pig Iron Association.

Paul L. Wolfel, formerly general manager of the American Bridge Co., and lately consulting engineer for the American Bridge Co. of New York, has resigned his position to accept the appointment of chief engineer of the McClintic-Marshall Construction Co., with works at Pittsburg, Pottstown and Carnegie, Pa. Until the American Bridge Co. was formed, Mr. Wolfel was in the employ of the Pencoyd Iron Works since 1888. His headquarters will be in Pittsburg.

## OBITUARIES.

Samuel Disston, who with his brother, Henry Disston, built up the great saw manufacturing works at Philadelphia, died June 27 at his home in that city at the age of 70. He was a native of England, but came to this country at an early age and spent practically his entire life in building up the Philadelphia business. His retirement from active connection with this concern was noted in THE IRON TRADE REVIEW of June 4. Mr. Disston was connected with many organizations in the business and social life of this city. He leaves a widow, two sons and two daughters.

Joshua Walter Rhodes, of Pittsburg, for the past eight years prominently identified with the manufacture of pig iron and with the development of iron ore resources, died in Detroit, June 30, from heart trouble. Mr. Rhodes was born in Pittsburg, March 31, 1872, the son of Joshua Rhodes, the well-known capitalist and steel manufacturer. The father, who still resides in Pittsburg, formerly operated the Pennsylvania Tube Works in that city, now a part of the National Tube Co. The young man, following in the footsteps of his parent, turned his attention to the iron industry. On May 1, 1900, he organized the Cherry Valley Iron Co. which purchased the blast furnace, coke ovens and coal properties of the Cherry Valley Iron Works located at Leetonia, O. The property was operated under this name until Nov. 1, 1905, when it was sold to the United Iron & Steel Co. Mr. Rhodes became a director and one of the largest stockholders of the company, but later retired from any active management, although he retained his interests. In addition to his activities in the iron world, Mr. Rhodes had been prominently identified with several Pittsburg banking and other corporations.

The Richmond Light, Heat & Power Co., Richmond, Ind., is planning to expend $60,000 for a new gas holder.

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July 2, 1908.

## A DEMAND FOR THE PRACTICAL IN COLLEGE TRAINING.

The several conventions of metal working interests during the past six months have almost without exception been featured by an extensive consideration of the industrial education problem, in the course of which the testimony of many prominent manufacturers has been anything but flattering to the engineering colleges of the country. There has been general complaint that the graduates of these institutions, on the average, are relatively long on undigested theory, short on its application in practical form and inclined to be shaky on the resulting combination. A degree from an engineering college is regarded far more lightly than is popularly supposed and requires a reinforcement of considerable practical experience to compel serious consideration by a good many progressive manufacturers. As one of them expressed it on the floor of a recent convention: "We never hire one of these graduates until he has worked a couple of years for somebody else."

The natural inference is that there is something wrong with the system of training pursued in our engineering colleges, and there is considerable evidence to support this criticism, not the least conclusive of which is the eagerness with which the manufacturing public is welcoming any system calculated to increase the practical element, acquaint the student with actual shop and business conditions and impress upon him the all important element of time. It is for these reasons that the Cincinnati manufacturers are giving such enthusiastic support to the plan of co-operative education practiced at their local university, under the direction of Prof. Schneider. For the same reasons, as powerful an organization as the National Metal Trades Association is urging the adoption of this plan in other parts of the country and training schools of as high grade as the Massachusetts and Armour institutes of technology are preparing to install it or have already done so.

A speaker before a recent gathering of manufacturers made the point that the present-day college is very largely a survival of the early monastery plan of training; then he put the question: "What is there of common sense in following an arrangement whereby the boy is withdrawn from the world for four years in order to prepare him for active participation in business?" The experience of one institution where the co-operative plan has been adopted furnishes food for serious reflection in the fact that several faculty changes were necessary, owing to the difficulties of certain instructors in replying to questions of an ultra-practical nature brought back by students from their shifts in the manufacturing plants.

The average American university is pretty much set in its ways, and the upsetting of its time-honored traditions is a task requiring limitless nerve and determination. Prof. Schneider discovered this fact in the years he labored before his plan was taken up at Cincinnati. Now it appears that even the short time this plan has been in operation has proved fairly conclusively that there is something wrong with the customary type of engineering training and that the next few years are to witness some radical changes.

## NEW LIFE FOR THE BESSEMER PROCESS.

The grave digger, who, several times during recent years, has been ready to give a respectable burial of the Bessemer process, must against lay aside his shovel with the prospect of indefinite postponement of need for its use. In spite of the many predictions that the open-hearth product would soon displace that of the pneumatic process, the latter has shown continued persistence, and its combination with the open-hearth furnace in the duplex process has been an important development. The announcement is now made that, by the application of the Gayley dry blast to the Bessemer process at the South Chicago works of the Illinois Steel Co., most encouraging results have been obtained, and we do not think that Mr. Dudley, in his letter to Mr. Gayley, published elsewhere in this issue, uses too strong language when he says that the first application of the dry blast to the Bessemer practice is of historic interest, and that from every standpoint of consideration and practical operation, a great step in advance has been made. The relation of this new development in steel manufacture to the problems confronting the makers of steel rails and other products, and to the use of ore, is of the highest importance, and the news giving the results obtained at South Chicago will be received with the keenest interest.

The Vulcan Detinning Co., which recently acquired the plant of the Empire Iron Metal Co., at Sewaren, N. J., has begun its operation at full capacity. It is understood that plans are in preparation for increasing the capacity of this plant in order to handle the entire output of scrap from the detinning works. The Vulcan company purchased the property out of its earnings.

The plant of the Standard Chain Co., at Sarnia, Ont., was badly wrecked June 7 by a heavy wind storm. After the disaster, nothing but the power house was left unharmed. The loss may run between $25,000 and $30,000. The plant was a new one built last July, and was of substantial construction.

## ANNUAL REPORT OF CRAMP & SONS' SHIP BUILDING CO.

The annual report of the William Cramp & Sons' Ship & Engine Building Co., Philadelphia, for the fiscal year ending April 30, compares as follows with previous years:

| Year—April 30. | 1907-08. | 1906-07. | 1905-06. |
|---|---|---|---|
| Net profits | $555,735 | $328,328 | $704,724 |
| Fixed charges | 313,008 | 324,920 | 333,752 |
| Surplus | $242,727 | $ 3,408 | $370,972 |

The general balance sheet as of April 30, compares as follows:

ASSETS.

| | 1908. | 1907. |
|---|---|---|
| Real estate, mach., etc. | $12,877,740 | $12,971,014 |
| Bills and accts., receiv. | 748,133 | 1,577,300 |
| Materials and supplies.. | 472,245 | 823,620 |
| Cash | 740,883 | 186,881 |
| Claims in litigation | 713,484 | 1,068,368 |
| Total | $15,552,486 | $ 6,627,184 |

LIABILITIES.

| | | |
|---|---|---|
| Capital stock | $ 6,098,000 | $ 6,098,000 |
| Notes, bonds and mtgs. | 6,134,912 | 6,319,912 |
| Wages, accts. & acc. int. | 333,773 | 963,521 |
| P. & L. account | 2,985,801 | 3,215,750 |
| Total | $15,552,486 | $ 6,627,184 |

In his annual report, President Grove says in part: "The unsettlement of business, following the late severe panic still continues, and as a consequence, the volume of current business is less than in previous years."

## AUTUMN MEETING OF THE IRON AND STEEL INSTITUTE.

The autumn meeting of the Iron and Steel Institute, 28 Victoria street, London, will be held at Middlesbrough, Sept. 28, 29, 30, and Oct. 1, in accordance with previous announcements. The provisional program of the committee, as announced through Secretary Bennett H. Brough, includes reading and discussion of papers on the mornings of Sept. 29, 30 and Oct. 1; works inspection on Tuesday; the witnessing and official opening of the dry docks on the Tees, and luncheons, banquets, etc., under the direction of the reception committee, closing Oct. 1 with a luncheon by the Cleveland Institution of Engineers, members and ladies accompanying them afterward to a garden party given by Sir Hugh and Lady Bell at Raunton Grange.

## LAUNCHING OF THE FREIGHTER DANIEL B. MEACHAM.

The steamship Daniel B. Meacham, named in honor of Mr. Meacham, of Rogers, Brown & Co., was launched June 27 at the Ecorse, Mich., yards of the Great Lakes Engineering Co. The ship was christened by Miss Eliza Jane Kennedy, daughter of Julian Kennedy, the noted steel mill builder, of Pittsburg. The ship was built for the Frontier Steamship Co., North Tonawanda, N. Y., of which W. M. Mills, manager of the Tonawanda Iron & Steel Co., is the moving spirit. The event was marked by the presence of the members of the American Society of Mechanical Engineers, then in session at Detroit. The excursion steamer, the Britannia, was chartered for the occasion by the steamship company, for the accommodation of the members of the society of engineers, and they witnessed the launching from the decks of the steamer anchored in midstream. The new steamer is a bulk freighter, 550 feet over

D. B. MEACHAM.

all, 530 feet keel, 56 feet beam and 31 feet deep. It will carry 10,000 tons.

## GREAT STEP IN BESSEMER PROCESS.

(Continued from first page.)

with the much discussed question of rail betterment and with the future of the Bessemer process. They indicate that Bessemer iron has been given a most powerful ally in contesting the ascendancy of the open-hearth product. The results of the tests are given in the following letter from Mr. Dudley:

SOUTH WORKS, ILLINOIS STEEL CO.
South Chicago, Ill., June 23, 1908.

JAMES GAYLEY,
First Vice President United States Steel Corporation,
71 Broadway, New York.

My Dear Mr. Gayley—I have been here at the mill at different times since the last of April having rails manufactured for the New York Central lines.

The first application of your dry blast to the Bessemer practice by William A. Field, the general superintendent, and his corps of able assistants, is of historic and technical interest in the efforts to reduce to a constant the variable element of moisture in the air from day to day to blow the bath of metal in the converter. The effects upon the skin of the ingots are noticeable at once by the absence of pit marks on the sides, except at the extreme top, which is discarded, and the metal blooms as though of greater solidity than usual.

A typical ingot 53 inches long cast in a new type of mold 65 inches high, 17¼ x 18¼ inches on the bottom and 16½ x 17½ inches on the top, was cut longitudinally in half without a trace of blow holes on the sides except at the extreme top, which confirmed the previous opinion of the solidity of the steel. The few central blow holes had clean, unoxidized surfaces slightly striated, and seemed to be the center of a limited segregation. Another ingot cast in the old style molds, 18½ x 19 inches on the bottom and 17 x 17½ inches on top, was cut in longitudinal halves, and had many blow holes and cavities near the top. This was the type of mold in use for many years; and the ingot cracked extensively in the three high blooming train, particularly near the butt end. The dry blast produced an ingot in the old mold which withstood the rapid three high blooming about twice as well as the ordinary blast as measured by the reduction in second quality rails.

Thirty-five sets, 240 in number, of the new style molds were ready for service on the 19th and 20th inst., and were used for 2,500 tons of Lake Shore & Michigan Southern and Michigan Central 100-pound rails. The dry blast was used in the Bessemer converter, the metal recarburized and held in the intermediate ladle three minutes, then turned into the teeming ladle and poured with a 1½-inch nozzle. The ingots were in the soaking pits about two hours, and bloomed in the three high rapid blooming train; and after the first pass the ingot was turned by a manipulator on the back side of the train. The rails had a good color, were tough and free from seams in the head or base. The oldest employes in the mill said these were the finest 100-pound rails they ever saw made here. In one lot of 1,238 bars on one side of the mill, my inspectors found only 14 for rejection.

The average grains of moisture per cubic foot of air for the two days was 5.98 at the inlet and 1.39 at the outlet of the dry blast. This lessened moisture in the Bessemer converter insures a better and more uniform grade of steel for the consumer and a reduction of second quality rails for the manufacturer. The blooms crop with sound ends, under the usual manufacturer's discard. It is a great step in advance for the Bessemer process from every standpoint of consideration and practical operation.

The blooming of the ingots should be slow and gentle until the skin is toughened, and from general observations the slow running two high trains with light passes at first are best. The control of low or high silcon irons is enlarged. It is stated 60 consecutive heats were blown with direct metal with silicon about 0.60 per cent last week. We expect to repeat our tests of last week this and also the succeeding week.

I am just as enthusiastic to secure sound ingots as when you visited me in the winter of 1894 at Scranton, Pa.; and the dry blast is an important aid in this humid, hot weather.

Very truly yours,
P. H. DUDLEY.

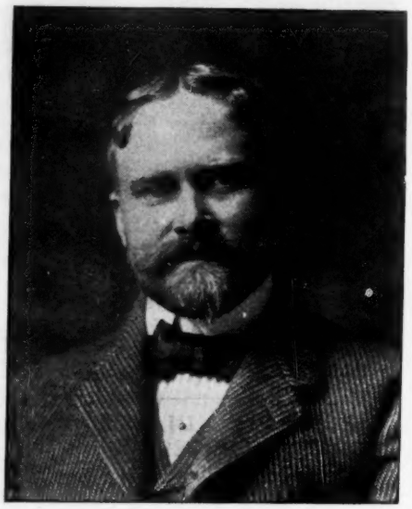
# MEETING OF THE LAKE SUPERIOR MINING INSTITUTE

## Mines on Mesabi and Vermilion Ranges Visited---Plan for Collection of Biographical Sketches --- Great Northern Power Plant Inspected

Voted the most interesting and best handled meeting the Lake Superior Mining Institute has held since its inception, the thirteenth annual gathering gave to the members in attendance a very adequate idea of the work in progress on the Mesabi and Vermilion ranges of Minnesota. Too much credit cannot be given to those in charge of the transportation of the party of nearly 250, both for the excellent service provided and for the strict conformity to schedule which characterized the entire trip. The program was wisely planned and made possible a very comprehensive inspection of the typical phases of mining in Minnesota. Much of the success of the meeting was due to the co-operation of the local reception committee, and, taken altogether, it is difficult to imagine wherein more could have been done or better arrangements made.

Wednesday morning was given to the assigning to members of quarters in the two special trains of sleepers. The transportation was in charge of the Duluth, Missabe & Northern railroad officials and assistants, and the party lived in the trains throughout the trip. On Wednesday afternoon a special train over the Northern Pacific road took a party to visit the hydro-electric plant of the Great Northern Power Co. The reservoir and dam, forebay and generating stations were viewed in turn. This undertaking, representing an investment of several million dollars, takes advantage of a drop of 375 feet in the St. Louis river through a distance of about four miles. It will be possible ultimately to generate close to 100,000 horsepower at this plant and electrical power will be furnished to cities as far distant as St. Paul and Minneapolis and to the Mesabi, Vermilion and Gogebic iron ranges. At present the generating station contains but three 10,000-horsepower units. These units operate with a vertical shaft, were built by the Westinghouse Mfg. Co., and are driven by specially designed Allis-Chalmers water wheels. They generate a three-phase alternating current at 660 volts and 675 amperes. The transformer and receiving stations are in Duluth. The plant as it stands is a splendid installation and though still incomplete is now running smoothly and regularly up to the capacity which it is generating. Returning to Duluth, the special followed along the course of the St. Louis river and the pleasure of an already interesting trip was enhanced by the beauties of the river scenery.

At dinner and during the evening the visitors were entertained at the Northland Country Club, and promptly at 1 a. m. Thursday the special trains left over the Duluth & Iron Range railroad for Ely and Tower. Beginning early in the morning, the surface equipment of the Vermilion range group, including the Pioneer, Zenith, Savoy and Sibley at Ely and the Soudan at Tower, was inspected. Of particular interest were the steel shaft houses at Ely, which are understood to be the first to be erected in the Lake Superior district, and the hoisting plants for the Savoy and Sibley. These hoisting plants were built by the Sullivan Machinery Co. and embody the latest ideas worked out by the engineers of the Oliver Iron Mining Co. At noon the train headed for the Mesabi range, the first stop being at the Biwabik pit. Although the extension work has not been so rapid there during the last few years as elsewhere on the range, the pit contours had changed greatly since most of the party had last seen it. At present the pit is shipping very little ore.



M. M. DUNCAN,
President.

From Biwabik to Eveleth is but a short ride. The train stopped at a point where a good view of the Fayal pit was obtainable and then proceeded to the Adams-Spruce group. The Adams mine has the first and one of the most representative milling pits on the range, from which about 1,500,000 tons of ore have been taken. About two years ago it was decided to strip this area and the progress made in removing the surface surrounding the old pit and to the west was very interesting. The boiler and engine house of the Spruce mine adjoining is one of the standard type used by the Oliver Iron Mining Co., and described in a paper presented by A. M. Gow. In addition it contains the first air compressor on the Mesabi range designed for electrical driving when power shall be available. It was built by the Allis-Chalmers Co., and is built with the air cylinders between the steam cylinders and the main shaft. On the main shaft is a rope sheave to be used for a rope drive when motors are installed. The steam cylinders can then be uncoupled and the transformation of driving agent made without further change of the machinery.

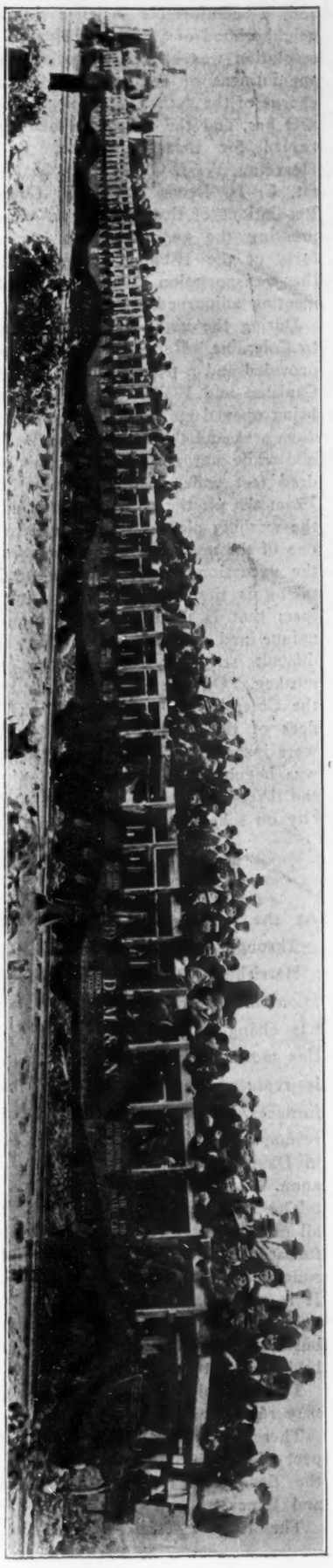
Leaving Eveleth, the party arrived in Virginia at 7:15 p. m. Not the least commendable feature of the program was the arrangement which provided meal time at the proper hour and while the party was in transit from one point to another. In this way the sightseeing was not in the least interfered with and meals were without confusion.

### Meeting of the Institute.

The first meeting of the institute was held in the Auditorium of the Roosevelt school in Virginia. The number and elegance of the schools on the range are perhaps well known, but even those who were acquainted with the fact could not but be impressed with the three school buildings which were opened to the institute at Virginia, Hibbing and Coleraine. President Cole presided at the meeting and throughout the trip was foremost in explaining and describing the various things of interest. The institute was welcomed to Virginia by the mayor and the hospitality thus extended was accepted in behalf of the visitors by W. J. Olcott, vice president of the Oliver Mining Co., who spoke briefly of Virginia's history and progress and

the great amount of work that was in store in the development of the neighboring mines. He mentioned his recent trip abroad, the pleasures of a trip through the Cornwall mining district of England, made some comparisons of their methods and those used in the Lake Superior region, and praised the miner from Cornwall for his sturdy character and the part he had played in developing the ore fields of the north. "No pleasure of the trip was so great," he said, "as the coming home, and the greatest lesson of the trip is the realization of the tremendous opportunities for men in this country."

President Cole reviewed in brief the undertakings during the two years since the institute last met. He spoke of the decision to use steel timbers in mine drifts and crosscuts instead of timber, the supply of which is so rapidly decreasing. He called attention to the progress in utilizing water power and the hydraulic plants at Sturgeon Falls on the Menominee river and on the St. Louis river. He told of the future of the steel plant now under construction near Duluth, and of the market to which products manufactured there, should go . He urged the necessity of preserving forest timber and the building up of reserves and pointed out the significance and magnitude of the problem of handling the sandy ores of the Coleraine district. His paper gave impressions of great progress made and of large enterprises undertaken. The papers of the evening were the "Structures of Mesabi Ores," by N. H. Winchell; "Automatic Throttle Closing Device for Hoisting Machinery," by Spencer S. Rumsey, and "Sampling of Iron Ores," by Prof. L. S. Austin. Dr. Winchell's paper was a geological discussion of the origin of certain Mesabi ores, his conclusions being drawn from a trip over the Mesabi in which the Mahoning, Mountain Iron and Biwabik mines, among others, were examined. While offering it as a suggestion rather than a final conclusion, the author of the paper, after relating what he found and his deductions therefrom, stated that to his mind the evidence might well be construed as pointing to an igneous origin rather than to the commonly accepted manner of water deposition. The second paper was illustrated with drawings and described the arrangement for controlling the throttle to prevent over-winding of the skip cable. This device is in use on the later hoists installed by the Oliver Iron Mining Co., and was designed by their chief engineer, S. J. Wessinger. The paper on ore sampling



was a general criticism of the inaccuracies of present methods and suggested some improvements in the mechanical handling of the samples.

**Other Mines Visited.**

A nominating committee was appointed to select officers for the ensuing year and a resolution was adopted extending the thanks of the institute to the local authorities for their co-operation. Until 10 o'clock the following morning, the mines east of the city were visited. Here the Steel Corporation in particular is working on a large scale, stripping the Oliver, Ohio, Lone Jack and Norman, and making of the four deposits one large pit. From Virginia the institute journeyed to Mountain Iron. The Mountain Iron mine, as the largest producer in the world up to last year, was the object of much interest. Not less interesting, however, was the elegant new club house built there by the Oliver Iron Mining Co. for its employes. Every practicable feature which might add to the comfort and sociability of the men seems to have been provided. It is a splendid building.

From Mountain Iron to Chisholm was the next jump. The train was pulled in on the spur of the Monroe-Tener mine. The Hibbing committee took charge at this point and was most courteous and efficient until the party left for Coleraine late that night. Flat cars upon which benches had been built and like those shown in the accompanying view, which was taken at Coleraine, were provided and the men were taken alongside of the Monroe-Tener pit. The largest mills on the range are to be seen here and in addition a large area is being stripped in preparation for turning the property into a steam shovel pit. From the Monroe-Tener the train of flat cars was pulled to the Morris mine, where the cars were run down into the mine, permitting the best possible view of this pit without leaving the cars. The same thing was done at the Hull-Rust. A better idea of the work here could not have been obtained than was possible from the cars as they traveled through the pit and stopped where one could look across the Mahoning on one side and the Hull-Rust, of almost if not quite equal size, on the other. From here the crowd was taken down to the baseball grounds and was the guest of the committee at a rattling good game between the Hibbing and Virginia teams. It was made doubly pleasant because of the lunch served by the committee ladies.

**Papers Read.**

The evening meeting was held in the high school building and the papers

presented were "Biographical Sketches," by John H. Hearding, including one of the late Peter White, taken from the book "The Honorable Peter White"; "Mine Waters," by A. C. Lane; "The Oliver Iron Mining Co.'s Standard Boiler House," by A. M. Gow; "The Hydro-Electric Plant of the Penn Iron Mining Co. at Vulcan," by Thomas W. Orbison and F. H. Armstrong, and "The Acetylene Lamp in the Mine," by W. F. Slaughter. In his paper Mr. Hearding outlined a plan for the collection of biographical sketches of members of the institute who had been prominent in the work of the mining districts and suggested that a perma-

A. J. YUNGBLUTH,
Secretary.

nent committee be appointed to have this work in charge. The other papers were descriptive. Aside from a few remarks intended to induce discussion, the papers of Mr. Gow and Mr. Lane were read by title only. With the paper already printed and in the hands of the members, it was quite generally suggested that this manner of presentation might very desirably be applied to all papers with resulting benefit to the meetings.

Following the papers the report of the nominating committee was received and the following officers elected: President, M. M. Duncan; vice presidents, W. J. Richards, Chas. Trezona; managers, F. E. Keese, W. J. Uren, L. M. Hardenburg; treasurer, E. W. Hopkins; secretary, A. J. Yungbluth. The meeting next year will be held on the Marquette range. The report of the council was read by the secretary and a comfortable balance in the neighborhood of $4,000 was shown. A resolution was offered authorizing the appointment of a committee to have charge of the gathering of biographical sketches, and the following men were named for that committee: J. H. Hearding, W. J. Olcott, Geo. A. Newett, C. H. Lewis and J. B. Cooper. Resolutions of thanks were passed expressing the appreciation of the efforts of the Hibbing committee and the transportation committee and the meeting adjourned.

During the night, the train traveled to Coleraine. Here also flat cars were provided and a trip was made into the Canisteo and Walker pits. These are being opened up over a really tremendous area and the cut into the Walker pit, while not more than a few hundred feet wide, is fully a mile long. From the pit the party was carried to the washing plant. This proved to be one of the most interesting features of the excursion. Another novel undertaking is the slushing dump. In the form that is used here this dump is unique and is used for handling the difficult stripping such as clay and muskeg. On the return to the train the Coleraine high school and the offices of the Oliver Iron Mining Co. were inspected. The return to Duluth was begun shortly after 12 noon and the three days' trip was ended in that city on schedule time.

## BETTER FEELING

### At the Furnaces and Rolling Mills Throughout Central Pennsylvania.

Harrisburg, Pa., June 30.—The situation in Central Pennsylvania mills has changed little since the first of this month, except that more inquiry is reported and a number of blast furnaces are being prepared for early resumption. Two stacks are in blast in Dauphin county and four in Lebanon.

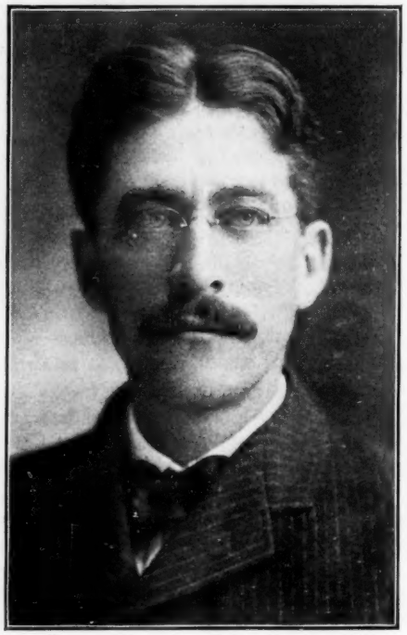
The Pennsylvania Steel Co. has put all of its new 75-ton open-hearth steel furnaces back on the active list and is running several of the older furnaces. It is probable that another blast furnace will be started before long if business improves. The company's bridge department continues busy.

The Lochiel rolling mills in this city may resume work early in July.

There is report of inquiry and prospect of new business at the plants of the Susquehanna Iron Co., in York and Lancaster counties.

The Empire Steel & Iron Co. is pushing repair work on its Topton furnace. The improvements at Catasauqua are well under way.

**New Byers Mill.**—Active construction is about to be inaugurated upon the new iron mill which the A. M. Byers Co., Pittsburg, manufacturer of wrought iron pipe, will erect at Girard, O. The plans have been prepared and estimates are now being made by builders, preliminary to the awarding of the contracts. The new works will consist of a puddle mill of 40 single furnaces, and a 16-inch skelp mill. The plant is to be located adjoining the Girard furnace of the Byers com-



E. W. HOPKINS,
Treasurer.

pany and the pig iron for the puddle mill will be supplied by the latter. Skelp will then be manufactured and this material will be supplied for the use of the pipe works of the company on the South Side, Pittsburg. The A. M. Byers Co. is also making improvements to its Girard furnace, at the present time, including relining and other repairs.

## RAIL AND BAR SALES.

(Special Telegram.)

New York, July 1.—The Carnegie Steel Co. will roll 7,500 tons of rails for the Erie during July. It has contracted with the Missouri and North Arkansas for 8,000 tons and with the Joliet and Southern for 700.

Good contracting in steel bars is reported and manufacturers generally feel that the worst is past.

# AMERICAN SOCIETY FOR TESTING MATERIALS

**Steel Rail Problems Thoroughly and Ably Discussed at the Atlantic City Meeting---Manganese Sulphide an Important Factor in Rail Breakages**

One entire session of the twelfth annual meeting of the American Society for Testing Materials, held at Atlantic City, June 23-27, was devoted to a discussion of steel rails. Much interest was manifested in the report on the microscopic investigations of fractured sections made at the Watertown arsenal, and the theory advanced that manganese sulphide, present under certain conditions, is a source of great danger, may lead to the limitation of the sulphur content in the chemical analyses of rails in the society's specifications. This development is the more interesting in view of the fact that several of the early makers of steel rails preferred a fairly high sulphur content to procure hardness and to insure satisfactory wearing qualities.

The meeting was held Wednesday afternoon and was attended by representatives of nearly all of the steel rail manufacturers. They, however, did not participate in the discussion to any great extent, although the difficulties that are being experienced by the railroads were fully and ably presented. That the solution of the problem is near at hand is certain, as both producers and consumers are putting forth their best efforts to secure a product that will be mutually satisfactory and that will meet all of the requirements of severe service conditions brought about by the use of heavier rolling stock within the past few years.

Before the subject was open for discussion, reports of investigations made during the year were submitted and several papers were read detailing various types of rail failures.

**Microscopic Investigations.**

The results of microscopic investigations of broken steel rails, particularly those in which manganese sulphide was found, were first reported by Dr. Henry Fay. He classified the causes of rail breakages under the following heads: (1) improper chemical composition; (2) segregation; (3) improper heat treatment; (4) rolling flaws.

Under the first of these heads, the most frequent sources of trouble were summarized as follows: Carbon, which may be too high or too low; phosphorus, which will produce brittleness when in excessive amounts; sulphur, which, if present as iron sulphide, will make rolling difficult; slag, an indefinite term embracing oxides or silicates or both.

Although sulphur, when present as manganese sulphide has generally been considered harmless, nevertheless the investigations made prove that it is extremely brittle and perhaps a dangerous material when present in steel under certain conditions.

Examinations of a number of rails which had broken in the foot in crescent form, in nearly every case revealed near the top surface of the fractured pieces, a thin layer of apparently more brittle material extending in the direction of rolling. In each one of these crescent breaks, manganese sulphide was found in the form of long threads, and microscopic examination showed streaks of ferrite running parallel to the manganese sulphide.

Having conceived a suspicion of the brittleness of manganese sulphide, Dr. Fay subjected a rail to strain such as it might get in service; and a crack developed which extended through the streak of manganese sulphide. Upon applying further pressure, the crack widened, indicating the brittleness of the material and the fact that it is cemented only weakly to the steel in which it is imbedded. An examination of the rail showed no further cracks, and the fracture of the metal of the section when broken showed a check which was found to be full of manganese sulphide, thus not only confirming the suspicion of brittleness but also establishing a relationship between checks and this material.

Further evidence was procured from a piece of metal cut out of a 12-inch rifle which had broken in service. This metal had shown streaks on machining and an examination showed a large amount of manganese sulphide in the streaks. The structure was distinctly sorbitic and indicated excellent heat treatment.

**Rolling Flaws.**

Rolling flaws were reported upon as follows:

"Only two fractures of this kind have been examined and from the evidence presented by these cases it would be unfair to draw any definite conclusions, but it is significant that the crack developed in each case followed a streak in which manganese sulphide was imbedded. In one case, the metal examined was cut out of the foot of the rail which had broken in service. The top of the foot was crimped in the process of rolling and the fracture took place at this point. A cross section of the crimped portion showed a crack fairly wide at the surface and narrowing as it proceeded inward. There was considerable flow of metal at the beginning of the crack, diminishing as it proceeded. Following the crack inward, manganese sulphide was found on the narrowest end and extending beyond the point where the crack stopped was a streak in which manganese sulphide was imbedded. In the same specimens, where the metal was crimped in rolling, there was found a large mass of sulphide which extended in a short distance from the surface of the rail and then extended further in two narrow streaks. With such brittle material it can be easily conceived as the starting point for a crack."

Experiments were also conducted to determine the melting point of manganese sulphide, and the freezing point was fairly sharp at 1,162 degrees Cent. Below the melting point the mass was decidedly plastic through a considerable temperature interval. As rail steel solidifies at about 1,450 degrees Cent., and if rolling begins at any temperature above 1,162 degrees Cent., the manganese sulphide will still be liquid from the temperature at which rolling began to 1,162 degrees Cent., and below this temperature being in a plastic condition it is elongated in the direction of rolling. For this reason, it was stated, steel high in sulphur should not be rolled at too high a temperature, for if much manganese sulphide is entrapped, it will be rolled out into a form that will ultimatey lead to trouble.

**Recommendations.**

In conclusion, Dr. Fay made the following recommendations:

"Specifications should be so drawn to limit the amount of sulphur in steel. At the present time, some of

the specifications do not even mention sulphur. The next step is to allow the metal to stand a longer time after the addition of ferro-manganese. With the specific gravity of manganese sulphide 3.966 and steel 6.82, it should rise to the surface and be skimmed off with the slag, if given sufficient time. Usually this time interval between the charging of the ferro-manganese and the pouring of the ingot is very short. The desire of the manufacturer to increase his output has led him to cut down this interval to the shortest possible limit with the natural consequence of a large number of broken rails. A longer time interval will allow the metal to purify itself. If, on the other hand, it is not permissible to start with a low sulphur ore, or to allow a sufficient time interval for the removal of the manganese sulphide, resort must be had to electric refining of the molten metal by means of a basic slag."

**Rail Tests at Watertown Arsenal.**

James E. Howard reported the results of some of the tests on steel rails in progress at the Watertown arsenal, Watertown, Mass. Service conditions which tend to cause rupture in steel rails were discussed as well as other features which have to do with the metallurgical side of the subject. In regard to the cold straightening of rails, it was stated that this straightening necessarily impairs the elastic limit of the metal, and permanent sets, although of limited extent, may be expected to develop under comparatively low loads. Photographs were shown of the scaling off of the surface of rails strained up to or beyond the elastic limit and it was found that gagging leaves marks on the rail showing a disturbance of the scale.

The heating of the surface of the rail head caused by the slipping of the locomotive driving wheels before starting a train was also cited as another cause which promotes rupture. The heating of the surface metal is followed by rapid cooling so that hardening of the steel occurs. There is also a change from a state of internal compression, existing while the metal is hot, to one of internal tension when the surface metal becomes cold, resulting in the formation of cracks in the steel, minute fissures forming in the head which are a menace to the integrity of the rail as a whole.

Longitudinal streaks in steel rails were carefully examined and tests conducted to ascertain whether their presence is of grave importance or not. "That they have contributed to many failures in the track, there can be no doubt," he continued, "and their elimination or amelioration is much to be desired if it can be accomplished. Fins are forced off the edge of a rail and split heads occur, and possibly each such line of fracture may be promoted by the presence of streaked metal."

The tests of steel rails conducted at Watertown form a part of the program of work of the testing laboratory at that place, on the subject of steel ingots and derivative shapes, a subject on which the laboratory is working in co-operation with and aided by a committee on metallurgical tests made up as follows: Major C. B. Wheeler, commanding officer, Watertown arsenal, Watertown, Mass.; James E. Howard, engineer of tests, Watertown arsenal, Watertown, Mass.; William R. Webster, consulting engineer, Philadelphia; Prof. Edgar Marburg, University of Pennsylvania, Philadelphia; James Christie, consulting engineer, Wissahickon, Pa.; Dr. C. B. Dudley, chemist, the Pennsylvania railroad, Altoona, Pa.; E. F. Kenney, metallurgical engineer, Cambria Steel Co., Johnstown, Pa.; J. P. Snow, bridge engineer Boston & Maine railroad, Boston; A. A. Stevenson, superintendent Standard Steel Works, Burnham, Pa.; S. M. Vauclain, Baldwin Locomotive Works, Philadelphia; F. W. Wood, president Maryland Steel Co., Sparrow's Point, Md.

A paper entitled "Some Results Showing the Behavior of Rails Under the Drop Test, and Proposed New Form of Standard Drop Testing Machine," by S. S. Martin, was read by title.

**Rail Failures.**

"Rail Failures—Mashed and Split Heads," was the subject of a paper presented by M. H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy railroad. He showed an etched section of a 100-pound rail which failed due to the mashing and splitting of the head. He added:

This kind of failure first shows itself to the trackmen by the development of a dark streak along the head of the rail from several feet to several yards long. At the same time, the head starts to sag down on one side or perhaps both sides, spreading somewhat at the same time. The first section was from a 100-pound rail laid about Oct. 15, 1907, taken up Dec. 27, 1907, being in service approximately 70 days. The marking indicated it to be the top rail of the ingot. It was laid as the outside rail of a three-degree curve and was the seventh rail from the beginning of the curve. The rail was removed on account of a black streak showing on the head of the rail and in addition to this black streak there could be detected by the eye a sunken portion on the outside part of the head about two or three feet from one end and extending over a length of six or seven feet.

Chemical tests were made from two different samples of this rail, one being taken from where the head seemed to be in the worst condition, which was 5 feet and 6 inches from the leaving end; the other being taken off the other end of the rail where it was apparently in good condition. These sections we will call "A" and "B," respectively. From each section borings were taken parallel with the length of the rail, one sample in each case being taken from an upper corner of the head and the other sample from near the junction of the head and the web.

The results of the analyses are shown in the following table:

| | Carbon, Per cent. | Phosphorus, Per cent. | Sulphur, Per cent. | Manganese, Per cent. |
|---|---|---|---|---|
| A—Head ... | 0.51 | 0.082 | 0.060 | 1.24 |
| A—Web .... | 0.81 | 0.117 | 0.152 | 1.38 |
| B—Head ... | 0.56 | 0.119 | 0.076 | 1.41 |
| B—Web .... | 0.64 | 0.163 | 0.114 | 1.55 |

It will be noted that there was very considerable segregation of the carbon, phosphorus and sulphur in both cases. In addition to the chemical analysis, we made some tensile tests of a piece taken close to sample "B," which are of interest. Two of the pieces were transverse pieces taken from the middle of the head and from immediately below and called samples 1 and 2, respectively. The third test piece, called No. 3, was a longitudinal test piece taken from the middle of the head and was the usual test piece ½ inch in diameter by 2 inches gage length. Results of these tests are given below.

TRANSVERSE TEST PIECES.

| | Dimensions, inches. | Tensile strength, pounds per square inch. | Elongation. |
|---|---|---|---|
| No. 1... | 0.696 x 0.292 | 50,095 | None |
| No. 2... | 0.507 x 0.293 | 58,600 | None |

LONGITUDINAL TEST PIECE.

| | | | Elastic limit, pounds per square inch. | Tensile strength, pounds per square inch. | Elongation in 2 inches, per cent. | Reduction in area, per cent. |
|---|---|---|---|---|---|---|
| 0.505 | in. | No. 3. diameter | 77,200 | 108,250 | 5.3 | 7 |

It will be noted that while the longitudinal test piece shows a good tensile strength, the elongation and reduction in area are very low. The transverse tests show low tensile strength and no elongation.

From the above examination, the splitting of the head is probably to be explained as follows: The load comes on the head of the rail more or less to one side due to the wear of the tread of the wheel or canting of the rail, which introduces transverse tensile stresses in the head of the rail, being greatest at the top. On

account of the bad segregation and in consequence of the weak condition of the metal, the material is unable to withstand the internal tensile stress and a crack develops internally, which gradually keeps on developing until it finally breaks through on the under side of the head where it joins the web. The top surface of the head for a depth of about ¼ inch being of normal composition and having the effect of the rolling is in good physical condition and it flows instead of developing a crack, which explains why the crack starts internally about ¼ inch below the top of the surface.

We have also examined some 75-pound rails which failed after six or seven years' service by heads splitting. Analyses of borings from these three samples, taken about as above explained, gave the following results:

| | Carbon, Per cent. | Phosphorus, Per cent. | Sulphur, Per cent. | Manganese, Per cent. |
|---|---|---|---|---|
| 75-lb. A-2—Head... | 0.47 | 0.078 | 0.032 | 1.08 |
| 75-lb. A-2—Web.... | 0.75 | 0.184 | 0.074 | 1.13 |
| 75-lb. B-2—Head... | 0.58 | 0.097 | 0.042 | 1.38 |
| 75-lb. B-2—Web.... | 0.66 | 0.146 | 0.078 | 1.24 |
| 75-lb. No. 1—Head. | 0.48 | 0.085 | 0.028 | 1.27 |
| 75-lb. No. 1—Web.. | 0.66 | 0.175 | 0.060 | 1.49 |

It will be noted here again we have considerable segregation of carbon, phosphorus and sulphur.

Segregation occurs mostly in the top rail of the ingots, where there is more or less sponginess of structure also, and split heads, that is, cracks, which develop after the rails are put into service, are probably due to this condition of segregation and sponginess. Pipes properly so called exist in the rail as rolled, but probably the great majority of failures called pipes by trackmen are really splits occurring as above described.

E. F. Kenney, metallurgical engineer of the Cambria Steel Co., Johnstown, Pa., followed with interesting notes on the rail situation, which were in part as follows:

The extended investigation and wide discussion of the steel rail during the last year has resulted in a much clearer conception of the problem than has been possible heretofore. The exchange of ideas between the makers and users has had a broadening effect on both, and has resulted in a disposition on the part of both to see a little of the other side of the argument.

Up to about 10 years ago, there practically was no rail problem. The breakage of rails was comparatively slight and, except in sharp curves, the wear was such that no one worried much about the behavior of the rails. The factor of safety was large enough to take care of the unusual conditions, but with the coming of the extremely heavy wheel loads and greater tonnage and speed which have been adopted in the last few years, the stresses and shock in the rail have increased. Moreover the difficulty in keeping up good track has increased, and as the condition of the road bed as to line, surface, etc., has an immediate effect in the stresses and shock in the rail, these elements combined with the direct effect on the rail from the increased loads and speed have so increased the rail's work that the factor of safety is about used up and the great number of failures today show that we are on the ragged edge.

### Section.

In almost any engineering structure, an increase in the load and stresses is met by the engineer by an increase in the resistance, by means of greater sections and stronger members, but there seems to be very strong opposition to an increase in the amount of metal in the rail. There are various reasons given for this, but none of them are convincing. One commonly advanced is the fact that rails of lighter weight, for instance 70 pounds per yard, show less breakage than the heavier rails. While there has been little evidence produced on this point, it is probably true. The light flexible rail will relieve itself by bending until it gets support, whereas the heavier rail being stiffer will stand up and take the stresses. This difference is shown in the behavior of the two sections under the drop test. Under the same blow the 100-pound rail will break very much oftener than the 70-pound but the deflection caused by the blow will be much less. In track we can keep better line and surface with the 100-pound rail than with the lighter rail, but in doing this we put more work on the rail and less on the other elements of the track. As the average cost of rail on American railroads is only about 7 per cent of the total maintenance charges, and as it is well known that the cost of maintaining track laid with 100-pound rails is decidedly less than that laid with 85 or 70-pound, it seems quite probable that the adoption of much heavier rail sections than those used today would be distinctly an economy because of the reduction of the costs of maintaining the track. Aside from economy it would unquestionably be an advance on the side of safety.

### Split Heads.

Regarding the split head, which is the type of failure probably causing more trouble than all the others combined, the following figures may be instructive. The figures are official, having been furnished by the railroads, and show the number of rails removed from tracks having failed out of each 1,000 tons rolled. All of the roads are lines having heavy traffic, "A" having the heaviest tonnage in the country.

"A" uses a deep headed rail, while "B" and "C" use a shallow headed rail. The number of 100-pound rails removed from track in one year per 1,000 tons rolled is 0.66 for road "A," and 12.59 for "C." The number of 85-pound rails removed from track in one year per 1,000 tons rolled is 0.59 for "A," 6.02 for "B" and 8.08 for "C." The percentage of failures was 10 to 20 times as great for "B" and "C" as for "A," and of these failures on the last named roads 90 per cent were in the head, namely, splitting, often spoken of as piping, while this type of failure was almost unknown on road "A" with the deep headed rail. The shallow head is an element of weakness which must be avoided if we are to escape this type of failure, and the necessary stiffness should be provided not by spreading the metal out so thin as to weaken the head and base of the rail, but by the addition of enough metal to furnish the required girder strength without weakening the section in its details.

### Rolling Temperatures.

The old types of rail in which the greater part of the metal was put into the head because it was the wearing surface and because it took the direct load for distribution to the other parts of the rail, left so little metal for the base that the edges were very thin and in the process of rolling they became much colder than the remainder of the section. This base was rolled at or near the critical temperature, resulting in a fine structure having great ductility, but at this temperature the metal in the base was so rigid that it prevented any work on the head. The result was that the head was finished too hot, giving a coarse structure which did not wear well, and was brittle. To correct this, sections have been designed increasing the size of the base, making it possible to roll the entire rail at a more uniform temperature but unfortunately robbing the head of some of its metal. However, the rolling of these rails so far has indicated that the structure of the metal in the head is much finer than in the old section and should give better results in track.

### Rolling New Sections.

The rolling of these rails has developed some surprises. It was expected that the rails could be rolled at a lower temperature than the old sections, and without thinking very deeply, most of us assumed that the shrinkage allowance could be reduced. We were therefore much surprised to find that under the same conditions, the new section would require a greater shrinkage allowance than the old. The rails were unquestionably rolled colder than the old section, with the exception of the thin flange, but it was this thin flange that determined the shrinkage of the old rails. In going through the cambering wheels the head was stretched, giving the hot head a greater length for shrinkage than the base. In the new section the temperature is nearly uniform and much colder than the head of the old rail was, but no part of the new rails is as cold as the thin base of the old, consequently a greater shrinkage allowance is required.

### Open-Hearth Rails.

A great deal is heard of open-hearth rails, and many persons seem to be impressed with the belief that the word open-hearth is a talisman which will cure all their troubles. Some rails which were made in open-hearth furnaces have given excellent service and others gave anything but good results. The writer, some years ago, suggested the use of very high carbon rails and advocated keeping the phosphorus as low as possible so that the carbon could be kept very high. In accordance with this, the Pennsylvania rail-

road made a trial lot of rails, 0.80 to 0.90 per cent carbon and less than 0.02 per cent phosphorus, the phosphorus being actually 0.009 and 0.011 per cent. These rails gave excellent service, not because they were open-hearth rails, but because the low phosphorus permitted us to use enough carbon to make them wear well. It is impossible to use this per cent of carbon in open-hearth steel much higher in phosphorus, and open-hearth steel much lower in carbon will not give the wear shown by these rails. On the strength of the behavior of these rails, 3,000 tons were ordered 0.80 to 0.90 per cent carbon and less than 0.03 per cent phosphorus, and we then had an exhibition of some of the difficulties to be encountered with open-hearth steel.

**Discard.**

In cropping the blooms at the shears, it is often impossible to tell when the piped portion has been entirely removed, and for a number of years the feeling has been growing that to guard against piping a heavy discard should be made from the top of the ingot. The writer was in favor of this and advocated a discard of 25 per cent, believing that this was the only way to insure the removal of all the metal containing these internal defects. The objection to this was the waste. Of all the rails put in track by the Pennsylvania railroad only about 1/40 of 1 per cent failed in any year. Assuming the average life at eight years, this would be 1/5 of 1 per cent, so that in discarding 25 per cent, we would be discarding 24 4/5 per cent of metal for the sake of detecting 1/5 of 1 per cent. A test has been devised which makes this waste unnecessary as the same result is obtained by the method of procedure advocated by the Pennsylvania railroad and the American Railway association and incorporated in the specifications which have been recently adopted by them. The crop end from the top of every ingot is tested to destruction, and if piping is shown, all the top rails from that heat are rejected. This practically means that about 30 per cent will be discarded from all heats which show piping, while those which do not show piping are cropped only the usual amount.

The Cambria Steel Co. has rolled a considerable tonnage of rails under these specifications, and the testing to destruction unquestionably detected the pipes. To find to what depth the pipes extended we polished the end of the drop test pieces and cut the top rail adjoining the test piece into small lengths, examining carefully each cut for pipes. It was found that of the heats showing pipes in the drop test piece when tested to destruction, 60 per cent contained pipes so short that they were confined entirely to the crop end. Of the remaining 40 per cent which extended into the top rail, the piping was as shown in the accompanying table.

It will be seen that even under this specification the rejection includes the 60 per cent of rails which contain no pipes.

**Drop Test.**

The principal test for rails has for years been the drop test. When the sections were comparatively light with low moments of inertia and comparatively limber, and before the excessive rail wear caused by modern heavy wheel loads and dense traffic was so great a factor as it is today, the test worked very well. Very few rails broke under the drop, and the test was not questioned, but changing conditions have been so modifying the effect of the drop test that there is a question as to whether the drop test as we are applying it is a proper one. In a recent series of tests made on pieces cut from the same rail some of which were subjected to 15 feet fall and some to 19 feet fall, in almost every case where a rail stood the 15 feet but broke under the 19 feet, the steel showed plainly by its fracture that it was not brittle but simply hard steel which could not extend as fast as it is necessary for the extension flange to extend to avoid fracture.

To show the relation between the blow of the drop test and service shocks we determined by trial the amount of fall required to strain the rail beyond its elastic limit and produce a permanent set. This was found to be about 12 inches for 100-pound and 8 inches for 85-pound rail. It is comparatively seldom that a rail is actually bent by the shock in service and yet we demand a test about 20 times as great in momentum and more than 20 times as great as far as the effect on the rail is concerned, as it is probable that the breakage under the drop is due really more to the speed of the tup than to the momentum. In other words, a test using a much heavier tup and a smaller drop might be fairer to the rail and more nearly approach the service conditions.

For years the testing machines have varied greatly at the different plants, some having practically no anvil at all on very elastic foundations, while others were fairly rigid. The results were therefore not at all comparable. A fall of a given tup a specified distance had a very different effect in one machine than in others. To show the different results obtained by using different anvils we took pieces from the same rail and subjected them to the same height of fall of a 2,000-pound tup in the new machine at Sparrow's Point, in the axle testing machine at Cambria and the rail testing machine at Cambria. The Sparrow's Point machine had a 20,000-pound anvil on concrete, the axle machine at Cambria having an anvil of 17,500 pounds supported on springs, and the old Cambria rail drop test having about 3,000 pounds of anvil. Taking the deflections obtained at Sparrow's Point as unity, those obtained in the axle machine were 97.6 per cent and those in the Cambria rail machine were 75.3 per cent.

The manufacturers have recently adopted a standard testing machine having a 20,000-pound anvil supported on springs. This will eliminate the variation due to weight of anvil and character of foundation, and the results obtained on one machine can be directly compared with those obtained on any other.

**Discussion.**

The discussion was opened by W. R. Webster, who briefly outlined the program of tests that will be carried out at Watertown. Referring to the planes of cleavage he said that these can be accounted for without resorting to the manganese sulphide theory.

J. P. Snow showed interesting specimens of rail section that failed in service. One failure was evidently due to a gas seam slightly below the surface of the metal and another showed evidences of a rolling flaw. This was inclined and fluted and the fracture evidently contained some scale. It was explained that a fracture of this kind is sometimes due to too great a reduction in rolling and that rolling flaws are the cause of more broken rails than gas seams. He said that the manganese sulphide theory might account for many failures. The remainder of his discussion in part follows:

White streaks generally run into fissures if followed far enough. They do not extend very deep, generally not over ⅛ inch, and they occur at different depths, sometimes at the surface, generally a little underneath the surface. They occupy the zone of the ordinary gas holes that occur so generally in ingots. Their plane is generally parallel to the axis of the rolls; that is, perpendicular to the surface of the base and top of head. The fissures accompanying this type of seams are straight and frequently are of a granular appearance as though they had been weakly stuck together before rupture. I attribute these seams and fissures to gas bubbles in the plastic steel of the ingots, and from this supposed origin call them gas seams.

If gas holes are deep seated in the ingot so that the seams will be from ⅛ to ¼ inch inside the surface of

**Extent of Piping in Rails.**

| Per cent. | | | | | Feet. | | | Feet. |
|---|---|---|---|---|---|---|---|---|
| 40 | showed | pipe | extending | more than | 1 | but less than | | 4 |
| 26 | showed | pipe | extending | more than | 4 | but less than | | 7 |
| 20 | showed | pipe | extending | more than | 7 | but less than | | 10 |
| 16 | showed | pipe | extending | more than | 10 | but less than | | 13 |
| 16 | showed | pipe | extending | more than | 13 | but less than | | 16 |
| 10 | showed | pipe | extending | more than | 16 | but less than | | 19 |
| 10 | showed | pipe | extending | more than | 19 | but less than | | 22 |
| 10 | showed | pipe | extending | more than | 22 | but less than | | 25 |
| 8 | showed | pipe | extending | more than | 25 | but less than | | 28 |
| 6 | extended all the way through (very slight). | | | | | | | |

the finished rail they do not seem to be of vital significance. Proper means for deoxidizing and quieting the steel, coupled with moderately slow teeming to the molds decreases the number of gas holes and causes them to be deep seated instead of near the surface.

In the great majority of cases of crescent base breaks the starting seam has been of the class called rolling flaws. Most of the rest have been gas seams on the surface. These flaws appear to be the result of checks, cracks or tears in the skin of the ingot or bloom. I believe this class of defects to be responsible for more broken rails than all other classes combined.

Inclusions of manganese salts are common and fatal when near the surface of the head. Manganese sulphide in particular is brittle and is probably the cause of most of the failures from split heads. Dr. Dudley and Mr. Maltitz show that by adding the spiegel when the bath is hot and allowing sufficient time for the reactions to be completed and the resulting salts to rise into the cinder before the metal is teemed, the danger from these inclusions will be lessened.

**Segregation.**

A fourth type of unsoundness is due to segregation. This leads to crushing of the head, flow of metal and rapid wear, rather than to absolute breakage. It can be controlled to some extent according to Prof. Howe, but it is more or less inevitable when steel passes from a liquid to a solid state. Segregated material in the head of a rail, especially if near the surface, is objectionable, but if confined to the base will lead to little trouble. Two ways of attaining this are open, viz., by throwing the ingots down before freezing is complete and controlling the turns so that the top of the ingot, as it lies in the soaking furnace, shall be formed into the base of the rail; and second, by rolling the ingot to a slab about 7 x 15 inches and splitting it at the last pass by cutting disks or otherwise, and rolling each billet into rails in such a way that the base shall be formed from what was the central part of the slab.

Dry air for the converter blast and proper deoxidizing and careful teeming will do much towards keeping gas holes deep seated and preventing slag inclusions. Reasonable treatment in the rolls will prevent rolling flaws. Segregation can be made harmless by confining its location to the base and web of the rails. It is possible that shelly corners of the rail may be due in large measure to the conditions caused by the corners of ingots being too nearly square.

Regarding the manganese sulphide theory, Dr. Henry Fay explained that he did not offer it as a panacea for all ills to which steel rails are subject, and the idea he intended to convey was that it was harmful when present under certain conditions.

Capt. William R. Hunt briefly traced the history of steel rail manufacture and explained that it was known that better ingots could be cast by pouring the steel through smaller nozzles and that shorter ingots make better rails. Good results are accruing from the investigations that have been made, and he cited one mill that has reduced its ingots to three-rail size, is allowing more time for re-heating, is using smaller nozzles in its ladles, and as a result the percentage of seconds has been reduced 50 to 75 per cent.

"Any process by which 25 to 35 per cent of imperfect product is made is wrong," he said. "It shows that the material must be so defective that no inspection can satisfactorily detect all the imperfections. A rail of heavy section is not as good as a lighter one on account of the lack of work put upon it."

H. D. Tiemann explained that by increasing the weight of the rails and the car wheels the impact is increased and added that this may account for some of the rail failures.

C. E. Stafford believed that the tendency in the blooming mill is towards too great a reduction of the ingot. In early practice, sections rolled from one-rail blooms, the latter being reheated, showed an average of seconds as low as 1 per cent.

Committee A on "Standard Specifications for Iron and Steel" then submitted its report, which embodied minor changes in the standard specifications for steel rails adopted by the society, Sept. 1, 1907. The changes adopted are noted in italics in the following paragraphs of the specifications:

**Drop Test.**

(3) One deep test shall be made on a piece of rail not less than 4 feet and not more than 6 feet long, selected from every fifth blow of steel. *For rails weighing 85 to, and including 100 pounds per yard, one drop test shall be made from every blow of steel.* The test shall be taken from the top of the ingot. * * *

(14) *No. 2 rails shall be accepted to at least five (5) per cent of the whole order.* Rails that possess any injurious defects, or which for any other cause are not suitable for the first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them. *Rails rejected under the drop test will not be accepted as No. 2 rails.*

A request was made that seconds be outlined more definitely and objection was made to the incorporation of any certain percentage of seconds to be accepted by the railroads. It was explained that the amount of seconds that can be accepted by the railroads can be arranged between the producer and consumer.

The following report of the subcommittee on discard and heights of drop was submitted at a meeting of Committee A:

The satisfactory height of drop is affected by the rail section used, and greatly by the drop-testing machine employed. * * * The information thus far obtained indicates:

1. Many of the drop-testing machines used in the past, have given very fallacious results, owing to inferior foundations and anvils.

2. Due to this defect in the drop-testing machines heretofore employed, but little reliable information in regard to the best and proper heights of drop can be obtained from past practice. * * * A proposed standard design has been prepared, and it is hoped it will be in shape to be presented at the next meeting.

In view of these uncertainties, and until more positive data can be obtained by experiment, your sub-committee does not see its way clear to recommend any change at the present time, in the standard heights of drop of the rail specifications.

In regard to discard, the developments of the past few months indicate a disposition to relegate the amount of discard tq the manufacturers, the consumers protecting themselves by such testing, as, it is believed, will enable them to secure only good rails for the track. Experimental rails made under the changed specifications. have been put in track, and their behavior is being watched, but no one can yet foretell the result.

In view of this situation, and in view of the discussion going on between the producers and consumers, involving the manufacture and quality of the steel used in making rails, and all the conditions of the service to which the rails are exposed, your subcommittee is inclined to think that the present wording of the society's rail specifications, in the matter of discard, is the best that can now be adopted.

On motion it was decided to continue the sub-committee for the further consideration of these questions, and to authorize it to co-operate, so far as practicable, with sub-committees of committees on rail specifications of other societies, with a view of bringing about a satisfactory basis of agreement.

In concluding the discussion, Dr. C. B. Dudley said that at the South Works of the Illinois Steel Co., South Chicago, Ill., dry blast is now being furnished the Bessemer converters and that the results are highly satisfactory is indicated by the following communication from Dr. P. H. Dudley: "The steel sets solid with scarcely a trace of blow holes found in the interior of the ingots which were without oxidized surfaces, quite in contrast to the ordinary ingots. The metal is exceedingly tough under the drop test. The moisture the past few humid days of 8 to 9 grains per cubic foot of air was reduced to less than 2 grains per

cubic foot entering the Bessemer converter."

## SECOND SESSION.

Following the presidential address on Tuesday evening, the corrosion of iron and steel was discussed, the first paper on the "Relative Corrosion of Steel and Wrought Iron Water Pipes," having been prepared jointly by H. M. Howe and Bradley Stoughton, was presented in abstract. The observations on which the paper was based were made in part in connection with investigations made on behalf of the National Tube Co., Pittsburg, and in part on independent inquiries which were made along lines that suggested themselves while the investigations were being made.

The evidence presented had a bearing upon the following three questions.

(1) How does the modern steel pipe of the National Tube Co. compare, as regards pitting and loss of weight by corrosion with the present wrought iron pipe?

(2) How does it compare with that company's steel pipe of 1897?

(3) How trustworthy is the basis of the popular distrust of steel pipe?

The steel, both that of 1897 and the "modern steel" was selected by the investigators at the works of the National Tube Co., and the wrought iron was ordered from works of high standing. The report of the tests in part follow:

The conditions of the tests were: First 12 pieces of modern steel skelp of 1906 and 10 of wrought iron of 1905 were immersed side by side, insulated from each other in wooden crates for 224 days in hot, aerated sea water, a condition which in previous tests has usually appeared the most unfavorable to steel. Then the same pieces of modern skelp were re-exposed in like manner for six months, with 12 pieces of steel skelp of 1897. Thus the time of exposure was as follows:

Wrought iron of 1906.... 224 days.
Modern steel skelp of 1906 13 months.
Steel skelp of 1897..... 6 months.

### Comparison Between Modern Steel and Modern Wrought Iron Skelp.

We found that, whereas the loss of weight in seven months of these two classes of skelp was practically identical, yet the wrought iron skelp, though from the best makers, pitted in seven months much deeper than the steel did in 13 months. By any method of comparison, the pitting of the wrought iron was much more than that of the steel, but it seems that the fairest way is to confine attention to the deepest pit in each plate. Using thus the deepest pit in each piece as a basis of comparison, the steel pitted very much less than the wrought iron. Thus nine out of the 12 steel pieces pitted very much less than any of the wrought iron pieces. The remaining three pieces of steel pitted only very slightly deeper than the very best of the wrought iron pieces.

The 1897 steel lost in six months about 9 per cent more by weight than the steel of 1906 lost in the same time, and pitted in six months much deeper than the modern steel did in 13 months. All but nine of the 12 modern steel pieces pitted (in their total exposure of 13 months) less than 0.005 inch; only two of the 1897 pieces (in their six-month exposure) pitted as little as this, and half of them pitted from four to 12 times as deep. The deepest pit in any of the modern steel pieces was 0.014 inch. But four of the 12 pieces of 1897 pitted as little as this, and of the remaining eight, four pitted at least half deeper than this, and one pitted more than four times as deep.

The general belief seems to be that pitting is the normal behavior of steel pipes and uniform slow corrosion without pitting the normal behavior of iron pipes. Such direct and trustworthy evidence as we find goes to show that this is untrue, and that well made steel and wrought iron do not differ materially in their tendency to pit.

George Schumann, of the Reading Iron Co., did not agree with the conclusions arrived at and contended that wrought iron pipe will resist corrosion better than steel. The layer of slag in iron, he argued, was a potent factor in retarding corrosion. He stated that he did not believe that wrought iron would outlast steel under all conditions, inasmuch as an acid solution that is strong enough to attack the slag will corrode iron faster than steel.

Replying to Mr. Schumann's argument in behalf of the protecting effect of cinder in wrought iron, F. N. Speller, of the National Tube Co., said:

This would be reasonable if the grains of iron are enveloped in cinder, or if cinder lies in sheets, between which are layers of iron. Aside from the fact that we have only 1½ parts of cinder to protect 98 parts by weight of iron, anyone who has looked at a polished section of wrought iron pipe under the microscope understands that the cinder is irregularly distributed and that there are many loop holes, more or less, through which corrosion is unobstructed; entirely free from cinder, moreover, owing to the concentration of cinder in places, electrolytic action comes into play, accelerating corrosion at the weak points. Hence, cinder in puddled iron seems to be the chief cause of irregular corrosion.

Tests made prior to 1903 in the laboratory indicated that pitting in steel was usually caused by electro-negative substances adhering to the surface of the metal, such as mill scale, which showed as much as 0.02 of a volt difference of potential to the iron. On removing this scale corrosion became considerably more uniform. It was found that steel which had been locally worked or forged gave better results than when simply rolled out.

We can in many cases prevent oxidation, without which corrosion is hardly noticeable. In the case of boiler waters or heaters, this may be accomplished in part by preheating the water, thus driving off the gases, or by passing the heated water over a large surface of steel turnings or other scrap.

Committee V reported that progress on the investigation of corrosion of iron and steel may be expected along the lines expressed in the following classifications:

*Metallurgical problems*: (1) To determine if it is possible to manufacture steel or iron which shall be highly resistant to corrosion. This to include the influence of impurities, conditions of segregation, heat treatment, etc.; (2) study of methods of coating with other metals, such as zinc, copper, lead, nickel, etc.

*Treatment subsequent to manufacture*: (1) Study of effect of physical condition of surface on resistance to corrosion; (2) study of inhibitive and excluding castings, such as pigments, oils, varnishes and cements.

To investigate the metallurgical problems cited, co-operative tests have been planned between the committee and the American Steel & Wire Co., to determine: The effect of possible segregation in the ingot; influence of high carbon and manganese vs. low carbon and manganese; effect of increasing amounts of manganese on basic open-hearth steel.

"Electrolysis and Corrosion" was discussed in an able paper presented by Allerton S. Cushman. While it has been shown that alkalies inhibit corrosion and acids stimulate it, it was suggested by the speaker that trenching with lime would be well worth trying as a protection for steel pipe lines that have been reported as giving trouble. It was pointed out that many metallurgists now agree that the use of manganese in steel making has been overdone and they are seeking to reduce the manganese content.

## WEDNESDAY MORNING.

The preliminary program of tests of steel columns to be executed at the United States Watertown arsenal was presented by J. E. Howard on Wednesday morning, having been recommended for adoption by the committee on program of tests of structural materials.

At one of the first meetings of the committee the fact that testing facilities have not kept pace with the advance in engineering construction was discussed and a resolution was adopted that the enlargement of the present facilities at the Watertown arsenal by the erection of a testing machine of at

least 10,000,000 pounds capacity is desirable.

The proposed general plan of these tests provides for a series of "standard tests" on members of rolled and built sections, designed and manufactured according to the best current practice, to be tested for central loading. Special tests are also to be made under eccentric loading and a single grade of steel is to be used in conformity with the specification of the American Railway Engineering and Maintenance of Way Association for structural materials for bridges.

The report of Committee T on the tempering and testing of steel springs and standard specifications for spring steel, was presented by J. A. Kinkead.

A series of tests conducted at the Baldwin Locomotive Works determined the effect of different methods of tempering on the elastic limit and modulus of elasticity which clearly demonstrated that the latter bear no close relation to each other.

Reports of further tests of staybolts were submitted by E. L. Hancock, and William Campbell read a paper entitled "Some Practical Applications of Metallography."

**Preservative Coatings and Lubricants.**

The Friday morning session was devoted to a discussion of preservative coatings for iron and steel as well as pending pure paint legislation. The report of Committee C was presented by S. S. Voorhees, chairman, and outlined tests that are being made to find the relative values of preservative coatings.

A. S. Cushman reported that a series of government tests are being conducted on pigments which have been divided into the following classes: Those which stimulate corrosion; those which are neutral, and those which inhibit corrosion. He also stated that no vehicle has been found for satisfactorily spreading pigments, not even linseed oil, which readily absorbs moisture.

The report of Committee N, on standard tests for lubricants, was presented by A. H. Gill, and other papers included, "Certain Solubility Tests on Protective Coatings," and "Analyses of Varnishes," by G. W. Thompson and P. C. McIlhiney, respectively.

**Testing Machines.**

Papers describing various types of testing machines and apparatus were read Friday afternoon. The use of an extensometer in commercial work was described by T. D. Lynch. Representative stress-strain diagrams on steel and other metals in tension, which showed in a general way their elastic phenomena were displayed. The curves selected were taken from the records of commercial work carried on in the laboratory of the Westinghouse Electric & Mfg. Co. The apparatus used in making the tests consisted of an Olsen, 100,000-pound testing machine and a Ewing extensometer reading directly to 0.000064 inch per inch of length. This extensometer, while necessarily delicate, is positive in its readings within relatively small limits of stretch, and it was stated that tests made with such precision should be considered commercial only along the lines of investigation and design.

T. Y. Olsen described a 600,000-pound universal testing machine for testing beams and columns which are now being used in building construction. New forms of pendulum testing machines were also described by Mr. Olsen.

An autographic recorder for commercial tension tests was described by H. F. Moore. This recorder draws a diagram from which may be determined the yield point, ultimate strength, and with a fair degree of accuracy the elongation and the work of rupture, and which can be used at speeds for commercial testing.

"Uniformity in Magnetic Testing and in the Specification of Magnetic Properties" was discussed by C. W. Burrows, who suggested uniformity in magnetic testing along the following lines: Magnetic treatment during the test; condition under which induction should be measured; limits of induction in a standard hysteresis loop and the size of the specimen to be tested.

**Boiler Plate Specifications.**

E. D. Meier, chairman of Committee R, on uniform specifications for boilers, submitted a report recommending a revision in the chemical properties of boiler steel prescribed by the society's specifications. These provide a limitation of the phosphorus for flange or boiler steel to 0.06 per cent for acid and 0.04 per cent for basic; fire box steel, 0.04 per cent for acid and 0.03 per cent for basic; extra soft steel, 0.04 per cent for acid and 0.04 per cent for basic. The limitations of the phosphorus was considered by the committee too high and it was recommended that it be no more than 0.04 per cent for the above kinds of boiler plate. The sulphur content, it was also suggested, should be limited to 0.03 per cent.

**Manganese Bronze.**

At the closing session on Saturday morning an interesting paper on "Manganese Bronze" was presented by C. R. Spare. He outlined briefly the vastly extended uses to which the various manganese bronze alloys have been applied in recent years, the methods of testing employed and the physical results obtained. Cast propellers, he stated, should show an average ultimate tensile strength of 70,000 pounds per square inch, elastic limit of about 35,000 pounds, elongation in 2 inches 25 per cent, and 25 per cent reduction of area.

**Uniform Chill in Rolls.**

At the opening session, Thomas D. West, Sharpsville, Pa., described a method of obtaining a uniform chill in rolls. The chill is designed to remain in intimate contact with the crust of the metal in the roll and can be vertically controlled to take care of contraction in that direction. The chill contains grooves which vary in height and number to meet different requirements, and exhibit gradual variation from the bottom to the top in the inclination of the sloping surfaces for the purpose of taking care of the vertical contraction of the solidifying crust. This serves to insure a close contact between the upper slope of every groove and the corresponding bead cast on the chill roll during the entire period of settlement.

**Standard Specification for Pig Iron.**

The revised specifications for foundry pig iron reported by Committee B, not yet adopted by the society and which abandon grading by fracture, are as follows:

**Analysis.**

It is recommended that all purchases be made by analysis.

**Sampling.**

Each carload or its equivalent shall be considered as a unit. At least one pig shall be selected from each two tons of every carload, and so as to fairly represent it. Drillings shall be taken so as to fairly represent the fracture surface of each pig. The sample analyzed shall consist of an equal quantity of drillings from each pig, well mixed and ground before analysis.

**Percentage of Elements.**

Opposite each percentage of the different elements a syllable has been affixed so that buyers, by combining these syllables can form a code word to be used in telegraphing such inquiries as they may desire to make.

Silicon.

| Per cent. | Symbol. |
|---|---|
| 0.50 | Ca |
| 1.00 | Ce |
| 1.50 | Ci |
| 2.00 | Co |
| 2.50 | Cu |
| 3.00 | Cy |

0.25 allowed variation.

Phosphorus.

| Per cent. | Symbol. |
|---|---|
| 0.25 | Pa |
| 0.50 | Pe |
| 0.75 | Pi |
| 1.00 | Po |
| 1.25 | Pu |
| 1.50 | Py |

0.125 allowed variation.

Sulphur.

| Per cent. | Symbol. |
|---|---|
| 0.04 | Sa |
| 0.05 | Se |
| 0.06 | Si |
| 0.07 | So |
| 0.08 | Su |
| 0.09 | Sy |

maxima gravimetric method.

Manganese.

| Per cent. | Symbol. |
|---|---|
| 0.50 | Ma |
| 0.75 | Me |
| 1.00 | Mi |
| 1.25 | Mo |
| 1.50 | Mu |
| 1.75 | My |

0.125 allowed variation.

**Cement and Concrete.**

Papers and discussions on cement and concrete were presented at the fifth and sixth sessions, Thursday morning and evening. An engineering smoker was held Wednesday evening and an informal dinner was given Friday evening at the Traymore Hotel.

The attendance at this meeting surpassed all previous records, and the large number of papers and discussions submitted, on widely divergent subjects, reflected a growing recognition of the work of this organization not only by producers and consumers of iron and steel, but by manufacturers engaged in other industrial pursuits.

# ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS AT PHILADELPHIA.

The first annual convention of the Association of Iron and Steel Electrical Engineers was held Wednesday, Thursday and Friday of last week, the sessions of the first two days being at the Engineers' Club of Philadelphia and the third day being devoted to an inspection of neighboring plants. Although but little more than a year old, this association now has a membership roll of 33 despite the fact that only the electrical engineer or the electrical superintendent of the larger iron and steel producing plants is eligible. About half the members were at Philadelphia and about a like number of visitors were present, these being chiefly representatives of concerns manufacturing electrical steel mill equipment invited to demonstrate their latest developments.

The sessions were executive throughout and partook largely of the nature of an experience meeting, with the free interchange of ideas gained from the individual experience of the members. The address of the president, James Farrington, of the LaBelle Iron Works, Steubenville, O., and of the secretary, G. H. Winslow, of the National Tube Co., Pittsburg, showed the young organization to be in a flourishing condition, both financially and in point of membership.

The opening session of "members' day" was marked by a thorough discussion of a topic of timely importance—the standardization of mill motors. In this connection, the idea prevailed that efforts should be centered on securing standard shaft extensions in order to provide uniformity in the fitting of gears and pinions. The members were furnished with prints of such proposed standards, covering the taper fit for pinions, and the question of a straight shaft standard was also considered at length. The association was given to understand that the makers of motors, particularly of the heavier types used in rolling mill work, would welcome the adoption of a definite standard and would co-operate with the association in its general introduction whenever a decision was reached.

Another interesting discussion at the Wednesday session was the demonstration of the Stoeckel induction clutch and drive by A. P. Stoeckel, its originator, and by L. V. Biue, vice president of the Wheeling Mold & Foundry Co., by which it is manufactured. The features of this clutch and its applications in driving electrical machinery were fully described and illustrated in THE IRON TRADE REVIEW of June 11, 1908. A report on its operation was also made by the association's secretary, G. H. Winslow, who recently investigated its work in connection with heavy blooming mill tables at the Wheeling company's shop. A model of the drive, with a train of rolls in miniature, was exhibited and used in the demonstration.

F. W. Stevens, electrical superintendent of the Ambridge plant of the American Bridge Co., discussed the subject of "Electric Drilling and Reaming," reviewing the difficulties encountered in this connection and predicting that a satisfactory type of electric reamer is to be expected. George W. Richardson, also electrical superintendent for the American Bridge Co., but stationed at the Pencoyd works, where he is in charge of some 600 motors, talked on "Electric Motors for Heavy Torque and Rapid Reversal," in the course of which address he emphasized the advantages of two motors in series of lesser armature diameter. Owing to the extreme heat, the paper on "Electric Motor Drives," by E. W. Yearsley, electrical engineer of the Midvale Steel Co., Philadelphia, was presented by title and will be distributed to the members. The program of the day was marked by extremely free discussion among the members and a very general comparison of notes in line with the co-operative spirit of the organization.

Thursday was visitors' day, being given over to the representatives of leading equipment manufacturers. Only the members and the representatives of the concern immediately interested were present during each demonstration or report. For the Westinghouse Electric & Mfg. Co., H. D. James spoke on the "Control of Motor Operated Auxiliary Apparatus for Steel Mills," and B. Wiley on the "Electrical Equipment of Rolling Mills." The convention was also the guest of this company Thursday evening at Willow Grove. C. T. Henderson, representing the Cutler-Hammer Mfg. Co., spoke on "New Resistance Grid, Interlocking Systems," and described the controlling apparatus installed by his company at Gary, Ind. The association was entertained at luncheon Thursday at the Hotel Walton by Gano S. Dunn, vice president and chief engineer of the Crocker-Wheeler Co. In the afternoon H. F. Stratton, of the Electric Controller & Supply Co., described the combination manual and magnetic switch controllers of that company. He was followed by R. C. Hull, of the Electric Storage Battery Co., who spoke on "The Storage Battery in Steel Mills" and on "Storage Battery Regulations of A. C. Currents." The General Electric Co. was represented by David B. Rushmore, J. G. Callan, James M. Andrews and K. A. Pauly, who described several important pieces of apparatus recently brought out by that company. For the Crocker-Wheeler Co., besides Mr. Dunn, R. B. Treat and R. J. Randolph Jr., were present. Among the apparatus they described was the Form W. rolling mill motor built by that company. The construction of this motor and some interesting experiments in its operation were detailed in THE IRON TRADE REVIEW of June 11, 1908. The Flame arc lamp was described by C. J. Toerring.

Friday morning was devoted to visits to a number of neighboring plants. A number of the members went to Atlantic City late in the week to attend the annual convention of the American Institute of Electric Engineers. It is probable that the next session of the association will be held in Chicago.

# THE NEW SHEET AND PLATE MILLS OF THE LA BELLE IRON WORKS AT STEUBENVILLE, O.

LaBelle Iron Works at Steubenville, O., recently completed and put in operation eight new sheet mills and a 72-inch plate mill with a capacity of 4,000 tons of sheet per month and 5,000 tons of plate. This new equipment makes a substantial addition to the already extensive plant of the LaBelle Co., a plan of which is shown in one of the accompanying illustrations. From this plan it will be noted that the company operates blast furnaces, open-hearth furnaces, tube mills, plate and sheet mills. The company also has its own coal mine on the property. The new addition is at the eastern end of the older equipment and comprises two plate mills, to roll plates 72 to 84 inches wide respectively, two 28-inch jobbing mills, eight 26-inch sheet mills, comprising a roughing and finishing pass each respectively, and three 24-inch cold mills. In addition a new galvanizing plant has been installed for the sheet mills and the proper finishing equipment for the plate mills. A new installation of gas producers has been installed in connection with these mills.

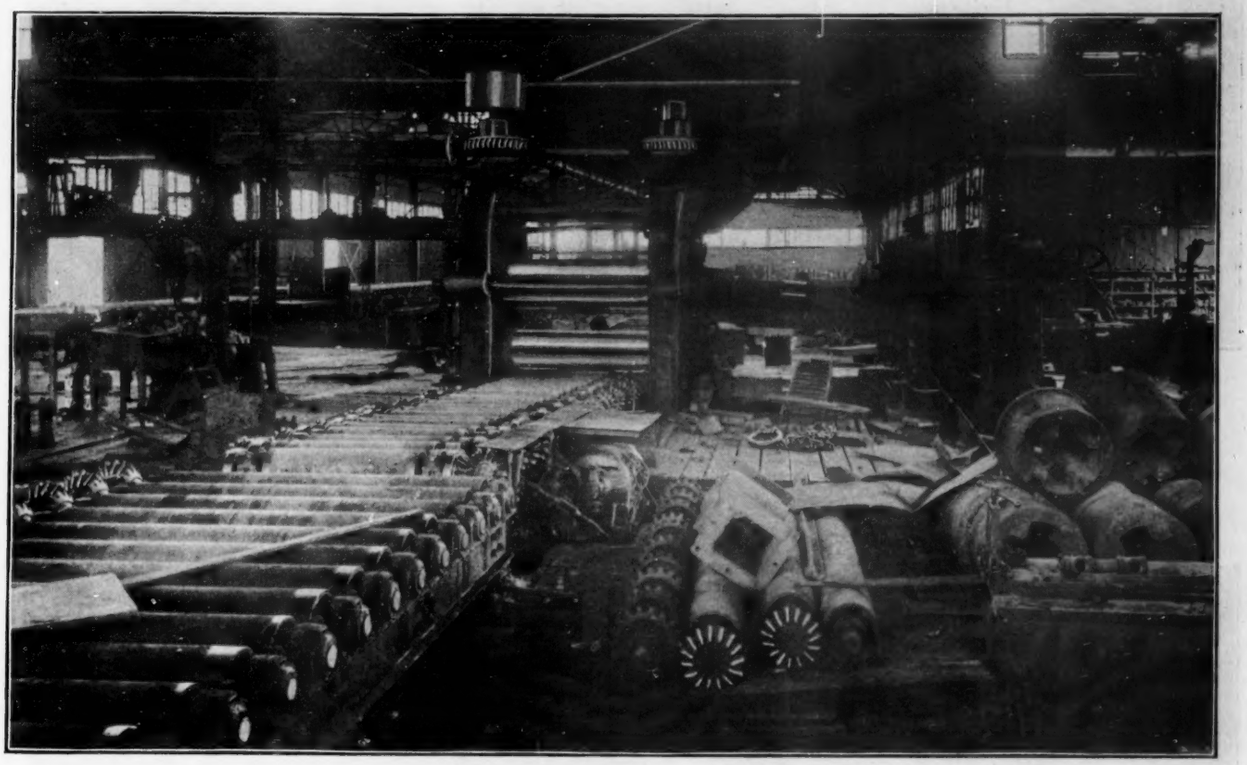


FIG. 1—72-INCH PLATE MILL, LABELLE IRON WORKS.

**Plate Mills.**

The general arrangement of the new extensions is shown in the ground plan Fig. 3. Considered in their relation to one another, the first building encountered in following the course of the material is that containing the heating furnaces. This is a steel and corrugated iron structure 100 feet x 250 feet in dimensions and contains two 9 x 40-foot Laughlin continuous furnaces, together with five Siemens heating furnaces each 7 feet 6 inches x 23 feet on the hearth. These latter furnaces are installed along either wall of the building, three on one side and two on the other—with a track carrying two 3-ton Alliance charging machines in between them. The continuous furnaces are parallel to and on either side of the axis of the building. They receive billets from the company's billet mill, these being delivered to a hydraulic transfer from which they are moved to the furnace on hydraulic pushers. Material can be brought into the Siemens heating furnaces from the stock yard on cars on a narrow gage railroad track which runs in front of all the furnaces as shown. A building 100 x 200 feet adjoins the furnace building immediately on the south and contains the plate mills. The entering tables of the plate mills are so placed that billets can be delivered directly from the continuous heating furnaces to the table of the 84-inch mill, which is placed with its axis parallel with the long axis of the building. Billets can be taken from the heating furnace by the charging machines and placed on the table of the 72-inch mill. The charging machines can also transfer billets from the heating furnaces to the table of the 84-inch mill. The 84-inch mill has been installed for some time, while the 72-inch mill has just been completed.

These mills were built by the United Engineering & Foundry Co., Pittsburg, and have tilting tables on both entering and delivery side. The operating pulpit is installed on a bridge between the two mills. Each mill is driven by a 44 x 60-inch Mackintosh-Hemphill Corliss engine and the mills are spanned by an Alliance Machine Co.'s 25-ton crane. The screwdowns are electrically operated on motors being placed on brackets on the housing as shown in the illustration Fig. 1.

Extending at right angles to the mill building is a building 250 x 100 feet through which the roller table and conveyors from the mill to the shearing and shipping building are led. At the entrance of this building and over

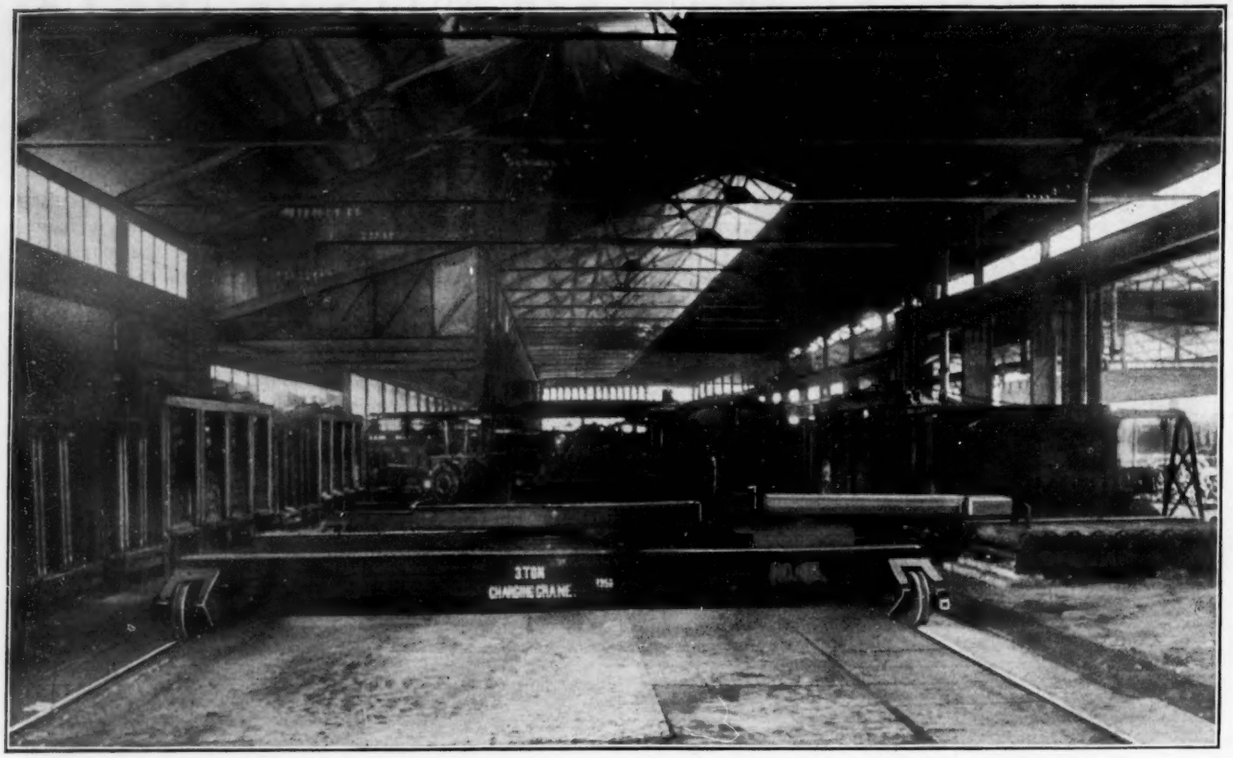



FIG. 2—HEATING FURNACES AND CHARGING MACHINES, LABELLE IRON WORKS.

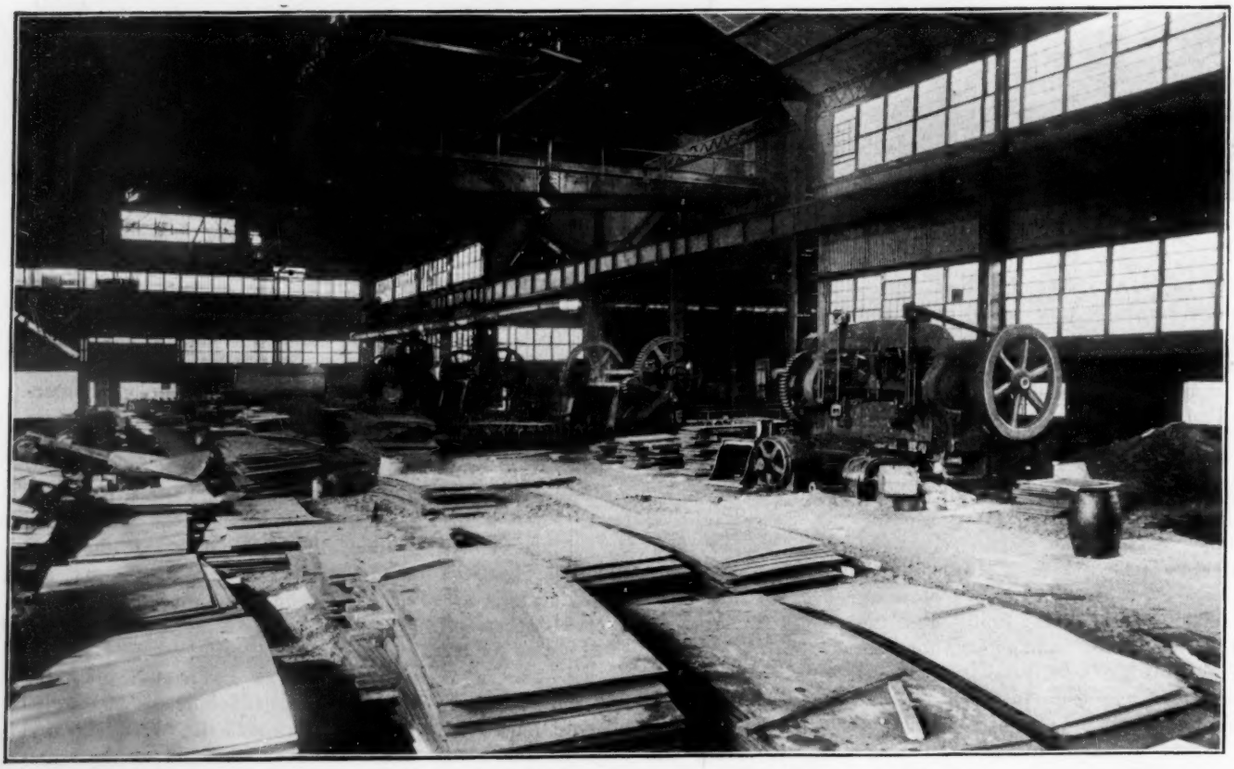


FIG. 3—INTERIOR OF PLATE FINISHING BUILDING, LABELLE IRON WORKS.

each roller table is installed a straightening machine for the plates. One of these was built by the United Engineering & Foundry Co., and the other by Hilles & Jones. The roller tables from each mill extend about one-half the length of the building and from there on to the end the plates are carried by a Heyl & Patterson four-strand roller chain conveyor. At the end of this building has been erected the shearing and shipping building 100 Newbold rotary shear. The shearing building is spanned by two cranes, one a 10-inch Morgan crane and the other a five-ton Alliance machine. A scale is installed at each end of the building and shipping tracks run into it as shown, being located in a pit so that the level of the cars is at the same height as the floor of the building. One of these tracks extends entirely through the building and alongside of the loading platform of the furnaces and beyond the sheet and pair furnaces is a stock yard, in which is stored the raw material for the sheet mill. The stock yard is bounded on one side by the sheet mill and heating building and on the opposite side by the gas producing plant. These various departments will be described in greater detail in order.

Taking up first the stock yard. This is 650 feet long x 75 feet wide and is covered for a distance of 300 feet at

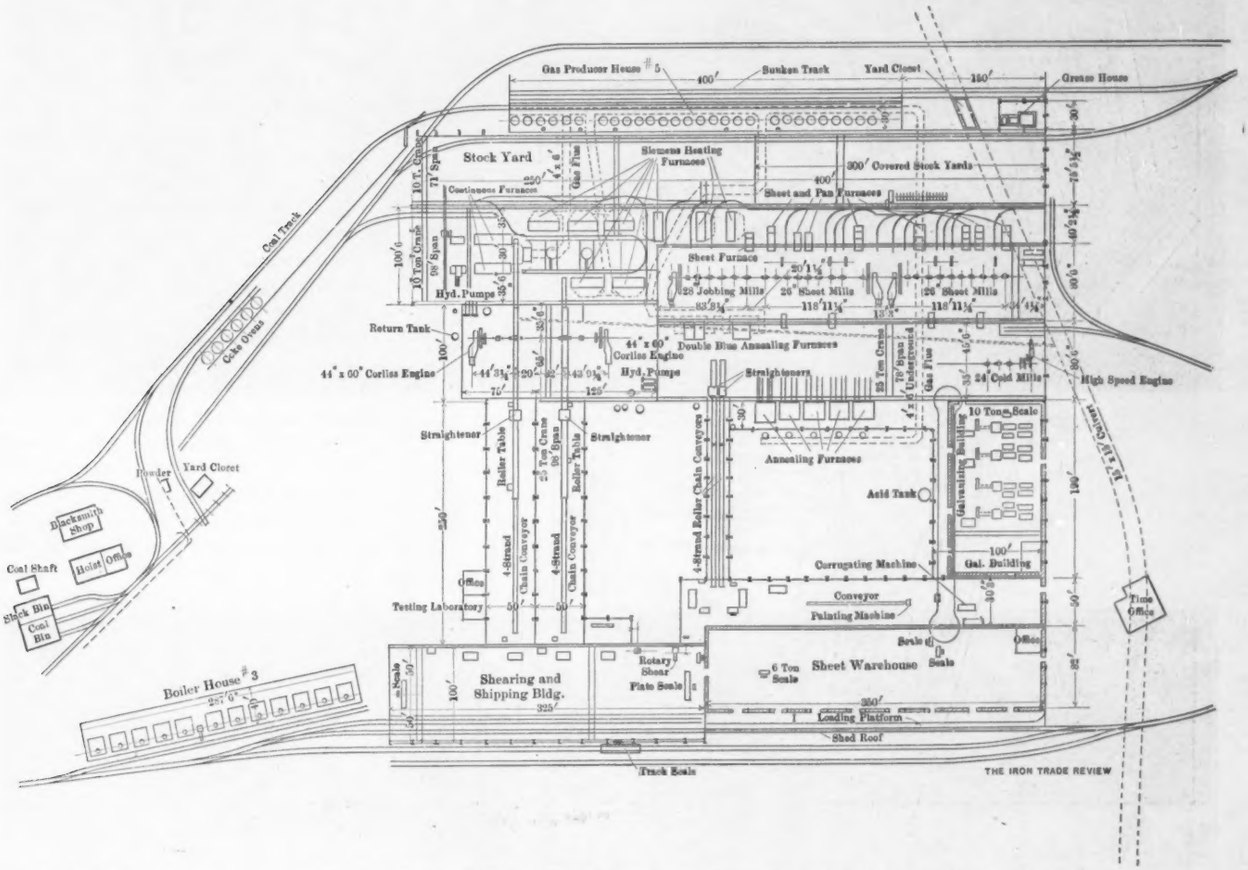



FIG. 4—PLAN OF NEW EXTENSION TO LABELLE IRON WORKS.

x 325 feet in dimensions and containing along its north wall six shears for finishing the plates.

The plates are carried from the end of the roller conveyors to the shears on inverted casters sufficient in number to provide easy handling. The location of the shears is clearly shown in the ground plan and in the illustration Fig. 4. They comprise two 110-inch machines built by the United Engineering & Foundry Co., Pittsburg, a 125-inch and a 146-inch shear built by Hilles & Jones, Wilmington, Del., and two 30-inch shears built by Mackintosh-Hemphill & Co., Pittsburg. Other equipment in this building comprises a 10-inch scrap shear and a sheet warehouse, which adjoins the building at the north end. The machinery in this building is driven entirely by individual electric motors.

### Sheet Mills.

The jobbing mills and sheet mills are installed in a building adjoining the heating mill and plate mill building on the north. This building is 400 feet long x 201 feet in dimensions and contains the mills as listed above, which are arranged in a straight line along its center line with the exception of the cold mills, which are installed in one corner. Directly adjoining and to the west of the mills are the heating furnaces and the sheet and pair its northern end. It is spanned by three 10-ton cranes, two of which were installed by the Alliance Machine Co. and one by the Morgan Engineering Co. Two of these cranes have five-ton auxiliary hoists. A bar shear installed by the United Engineering & Foundry Co. is situated near one end of the stock yard and is provided with a roller table. It is used for cutting the sheet bars into the proper length for rolling into sheets. The cranes are equipped with lifting magnets to facilitate the quick handling of the material. A narrow gage road runs along the side of the stock yard immediately adjoining the mill building. Spurs from this track run into the building be-

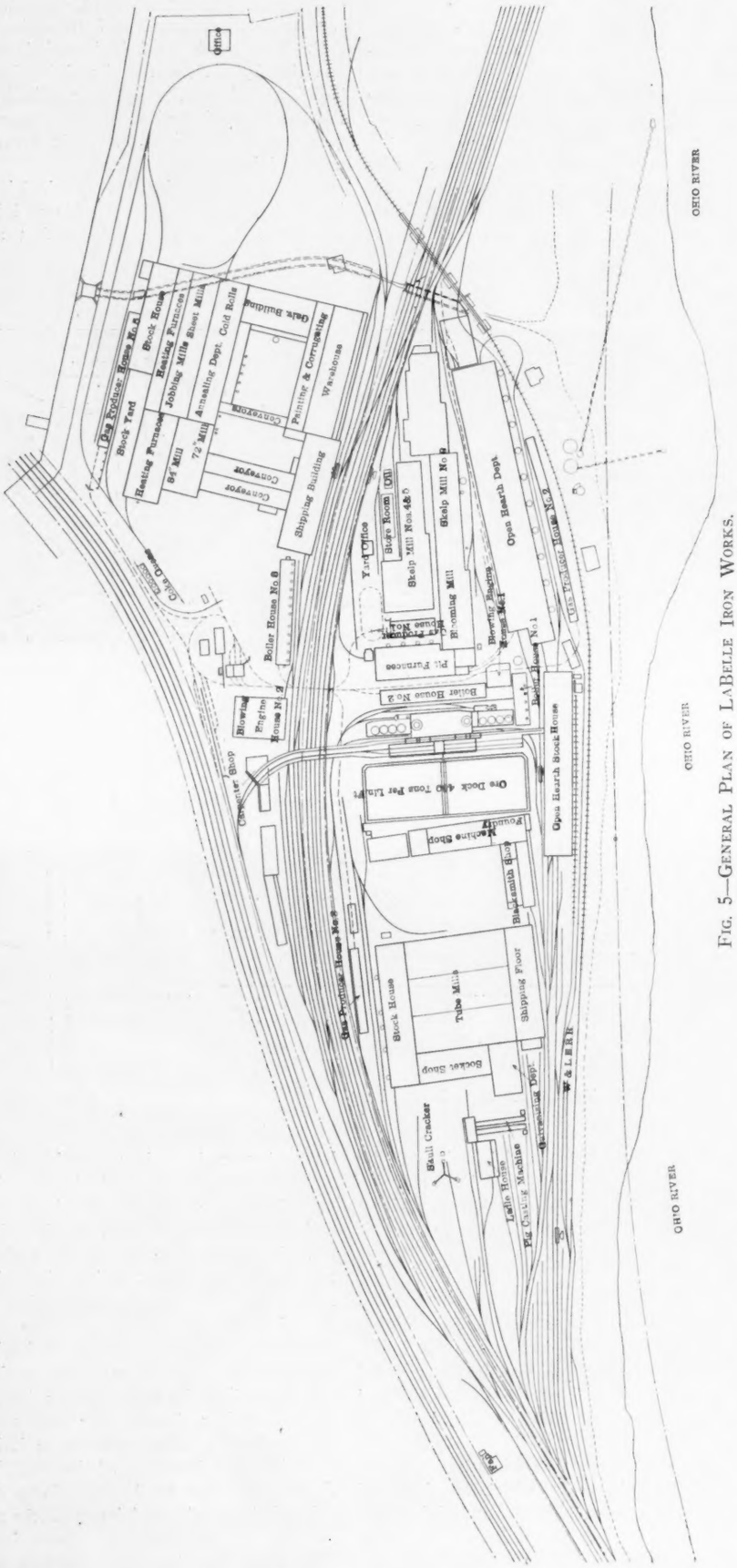



FIG. 5—GENERAL PLAN OF LABELLE IRON WORKS.

tween the various furnaces and afford a ready means of transferring material from the yard to the furnaces.

### Jobbing Mills.

In connection with the jobbing mills are installed two Siemens heating furnaces with hearths 7 feet 6 inches x 20 feet 1½ inches, one Swindell sheet furnace and eight Swindell sheet and pair furnaces, and are installed in connection with the 26-inch sheet mills. The sheet and pair furnaces are each 8 x 10 feet and 6 x 7 feet. The jobbing mills are two in number and each comprises a finishing and roughing stand driven by a 36 x 72-inch Mesta-Corliss engine. These mills have a capacity for plates in the roughing stand 54 and 66 inches long. They are equipped on either side with a hydraulic lifting table to facilitate the handling of the sheets back and forth. The material is brought from the heating furnaces to the mills by trolleys and from the mills by the same means to a pair of double annealing furnaces built by Wm. Swindell & Bros., Pittsburg, and located as shown in the plan view Fig. 3. After being taken from the annealing furnaces, which are operated with gas fuel from the producer plant, they are transported over casters, as shown in Fig. 6, to a conveyor leading to a pair of Hilles & Jones straighteners. After passing through the straighteners they are carried by means of a pair of four-strand Heyl & Patterson roller chain conveyors to the finishing building some 190 feet distant. This building, of steel construction, is built as a lean-to to the sheet warehouse and contains a pair of 126-inch shears built by Hilles & Jones and a similar machine built by the United Engineering & Foundry Co. for trimming the sheets. Two six-ton scales are installed adjoining the two Hilles & Jones machines. In this building is also installed a painting machine, its location being clearly shown. Another interesting machine installed in this building is the sheet corrugating machine, which is of the Poorman rotary type. It comprises two cylinders with corrugations cut on their surface meshing with each other somewhat after the manner of gear wheels. The diameter of the cylinder is such that its circumference is equal to the width of two plates. As the corrugations are removable, the machine may be set up to corrugate plates with different size corrugations at the same time. The feeding table is so constructed that it always registers with each set of corrugations and it is, therefore, impossible to give

FIG. 6—ANNEALING FURNACES AND CONVEYOR TO STRAIGHTENER, JOBBING MILLS, LABELLE IRON WORKS.

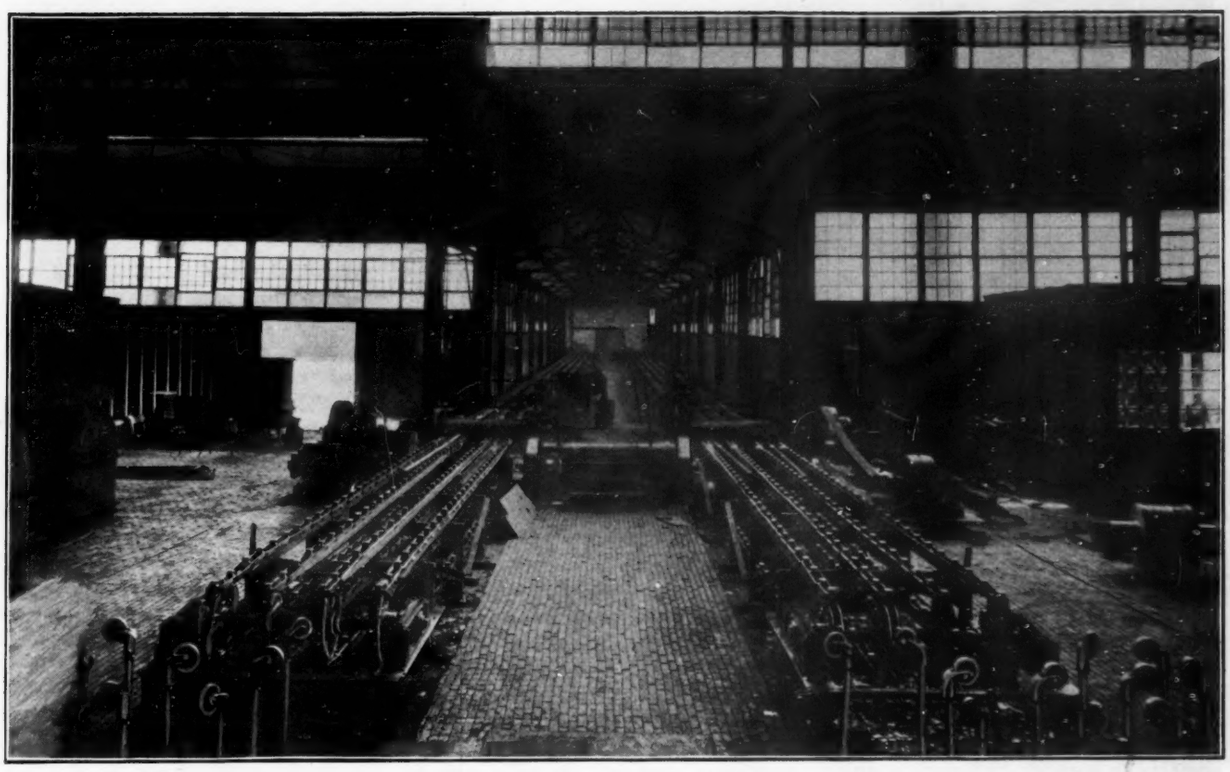


FIG. 7—CONVEYOR AND STRAIGHTENERS, JOBBING MILL OF LABELLE IRON WORKS, LOOKING IN OPPOSITE DIRECTION FROM FIG. 6.

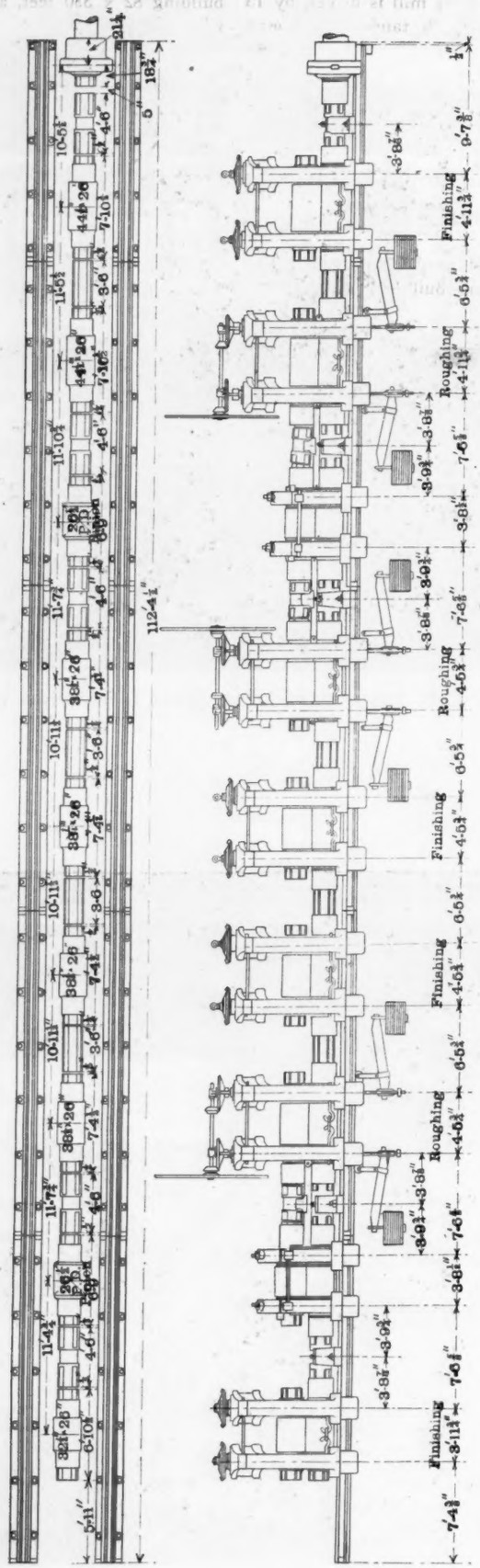



FIG. 8—DETAILS OF SHEET MILL TRAIN, LABELLE IRON WORKS.

a plate corrugations of two different sizes.

**Sheet Mills.**

The sheet mills were furnished by the Wheeling Mold & Foundry Co., Wheeling, W. Va., and the Mesta Machine Co., Pittsburg, and comprise two complete trains in line on either side of the engines, which are direct connected. One train consists of a set of pinion housings with a mill made up of finishing and roughing rolls to either side of it. The other train has a mill made up as before of roughing

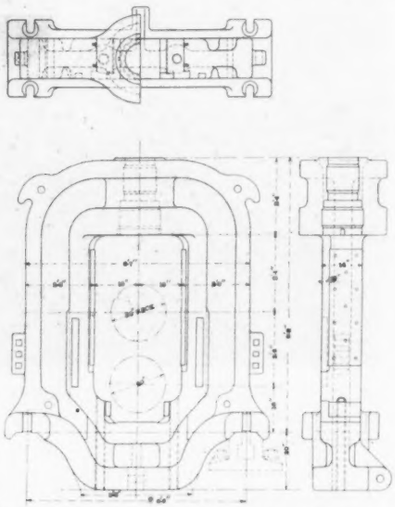


FIG. 9—HOUSING OF SHEET MILL, LABELLE IRON WORKS.

and finishing stands on one side and a set of bull head rolls on the other, and it is, therefore, a three-mill train with a set of bull heads. Fig. 10 is a view of the sheet mills looking down the length of the building, while Fig. 8 is a detailed drawing of the train and shows the arrangement quite clearly.

All of the mill housings are cast steel, weighing practically 2,600 pounds each. The pinion housings are of iron and have a weight of about 1,200 pounds each. The pinions are of cast steel 26½ inches pitch diameter, 26 inches face and 6 inches pitch, with V teeth. All coupling boxes and spindles are of cast steel. The finishing rolls are chilled, and the roughing rolls are sand cast. The necks are 20 inches diameter and 16 inches long; the wabblers being 9 inches in length. On the roughing mills, steel housing nuts and 8-inch screws with 1-inch pitch are used in connection with a bevel gear and hand wheel screw down. The upper roughing rolls are balanced as shown and have a lift of 6 inches The finishing roll screws are the same as those on the roughing mills, but

have ¾-inch pitch, and the usual spanner wheels and wrenches are used. The bed plate under these mills has a weight of 500 pounds per running foot on each side. The various shoes are securely bolted together, giving a total length of 112 feet 4½ inches. Fig. 9 is a sectional outline of the cast steel housings used on these mills. The mills are driven by a pair of simple Mackintosh-Hemphill Corliss engines, the cylinders of which are 36 x 72 inches. A 25-ton Morgan Engineering Co.'s crane covers the sheet mills, but the other spindles and boxes are of cast iron. This mill is driven by 13 and 22½ x 30-inch tandem-compound Buckeye engines through a single-gear reduction. The cold mill and the space in front of the annealing furnaces is commanded by a Morgan Engineering Co. 25-ton crane with a five-ton auxiliary hoist.

At the extreme northern end of the sheet mill building and extending at right angles to it is a brick building 190 x 100 feet used for a galvanizing plant. In this building are installed

The sheet warehouse is a brick building 82 x 350 feet, amply provided with scales for weighing sheets as they are shipped. Along the eastern edge of it is a covered loading platform with an elevated track running alongside.

The gas producer plant mentioned earlier is situated on the extreme west of the new extension. It comprises six Swindell producers and 22 Laughlin producers, the Swindell producers serving the annealing furnaces and the Laughlin producers the heating furnaces and annealing furnaces for the jobbing mill and plate mills. Coal is brought into the producer plant on a trestle from which it is dumped directly on the charging floor of the producer plant. A sunken track extends along either side of the producer plant to facilitate removal of ashes, one of these tracks also serving the stock yard.

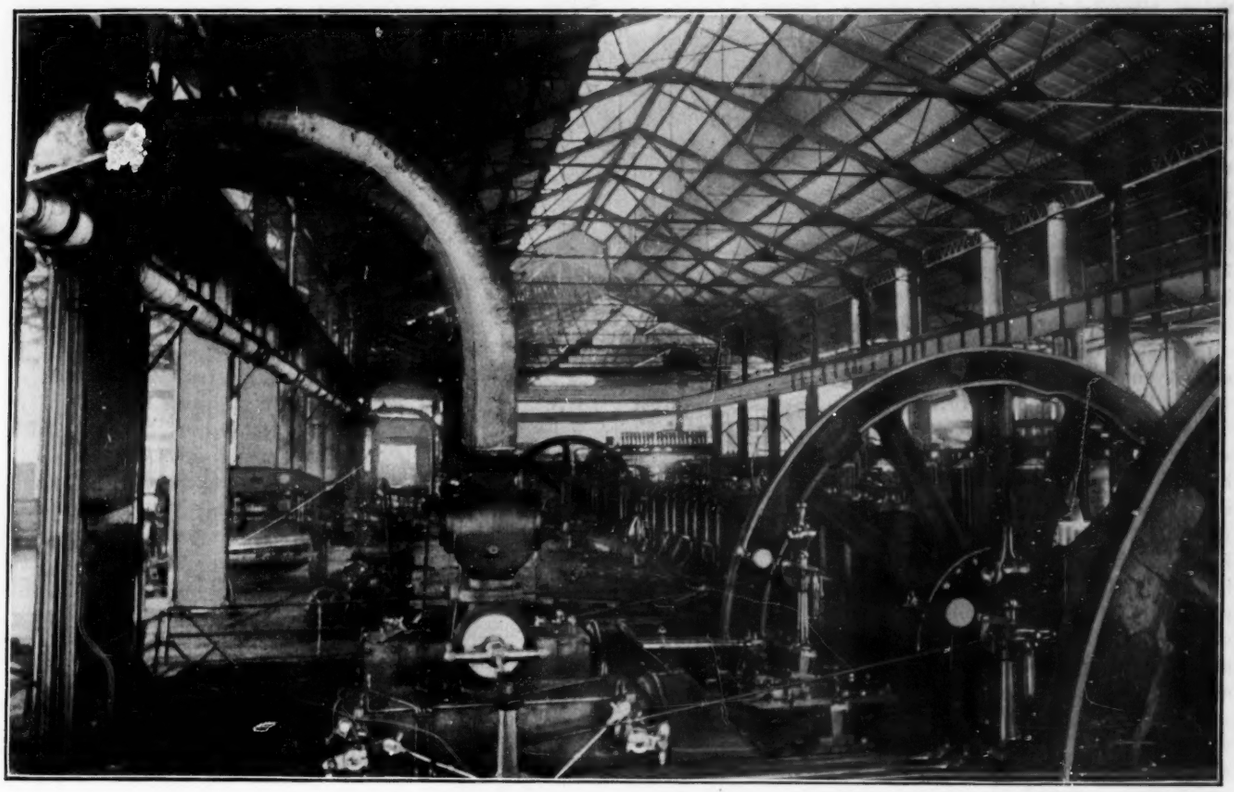


FIG. 10—INTERIOR OF SHEET MILL, LABELLE IRON WORKS.

it being equipped with a five-ton auxiliary hoist. In connection with the sheet mills are installed five Swindell box annealing furnaces, one of which is 18 x 18 feet. The four remaining furnaces are each 16 x 16 feet 6 inches. These furnaces operate on producer gas from the battery installed to the west of the stock yard.

A three-stand 24-inch cold mill also forms part of the equipment of this department, which was also furnished by the Wheeling Mold & Foundry Co. These mills are each provided with cast iron housings, each of which weighs 15,200 pounds. The bed plate for this mill weighs 350 pounds to the foot on each side and has a total length of 38 feet 8 inches. The leading spindle of this mill is of cast steel,

two hot galvanizing machines for 26 and 52-inch sheets respectively. They were installed by the Erie Foundry Co., Erie, Pa., and each comprise two washing tanks, a pickling tank, acid tank, galvanizing tub, squeezer and cooling frame. Space has been left in the building for duplicating the present equipment. A 10-ton Morgan crane commands this building. Other transportation is furnished by means of a four-ton Sprague traveling electric hoist, which extends through a passageway on the outside of the galvanizing building into the sheet mill building, back through the galvanizing building completing the circuit in the sheet warehouse, as shown in the ground plan of the new extensions, Fig. 3.

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The American Institute of Electrical Engineers has elected the following officers: President, L. A. Ferguson; vice presidents, C. C. Chesney, Calvert Tounley and B. Gherardi; managers, David B. Rushmore, H. E. Clifford, C. W. Stone and W. G. Carlton; treasurer, George A. Hamilton; secretary, Ralph W. Pope.

# THE GENERAL PRINCIPLES OF COST ACCOUNTING[1]

By Oscar E. Perrigo.

Primarily manufacturing consists of adding to the value of raw material by the application of certain processes of labor. To manufacture is not to create, but to change the form of materials so as to adapt them to new uses. That which is the finished product of one manufacturer may be the raw material of the next. To the miner, ore is his finished product, while it is the raw material of the furnace man. His finished product is pig iron, which is the raw material of the iron founder, while the finished castings produced in the foundry become the raw material in the machine shop, and so on. Each of these have added to the value of the original raw material by the processes which they have used to advance it toward its ultimate state of perfection and usefulness. In all these processes, labor has been the thing absolutely necessary. Better processes may be devised, and elaborate machinery invented and built, but all are useless without labor to operate them.

Man changes material to new forms and thus renders it more useful to himself, but in so doing he continually consumes and destroys something, or changes it into some other form of little or no further use to himself, and every process is accompanied by and accomplished with some sort of destructive action or result. To generate power, he consumes coal, to produce lumber, he must destroy forests, and to produce many useful chemical substances he must destroy the original substances of which they are made.

In all these changes the first factor that is prominent is the material, which nature has provided for the use of man. The second factor is labor, since man cannot produce any change for his own or others' benefit without labor. The use of the first and the operation of the second of these factors entail the burden of a third factor, expense. Even the simplest form of manufacturing must combine these three elements of material, labor and expense.

For instance, a nailmaker may purchase material, add his labor and thus produce nails, which he may sell for the money which will supply his needs. But he must have a place in which to work. He may build this himself, but it will cost something, because if he obtains his materials from the forest he must apply his own labor, which is of value, since with it he might make more nails and sell them to the dealer for money. He may work in his neighbor's building, but he must pay rent. So that, whatever he does, he is assessed an expense, as a third element or factor in the problem of manufacturing, and one which must always be added as a portion of the expense, and which must be paid out of the amounts he receives for his product in addition to the cost of his material.

When the first month has been completed, he desires to know how he stands. He says, "I spent so much for my iron, and I have so much of this on hand. It is worth so much." That is inventory. The difference between the two amounts is the cost of material. Again, "My time is worth so much per day, and I worked 26 days." That is the labor cost. "I paid Jones so much for rent, and I paid so much for heat and so much for light." These constitute his overhead burden. "I made so many nails." They are the product. "I sold them for so much money." That is the income. Adding the three items of expense gives the cost. Subtract this from the amount received from sales, or income, and he has the profit. The process by which he learns this is cost keeping, simple in form, but in principle always the same.

Assume that our nailmaker finds a market for more nails than he can make himself. He must employ men to assist him, and becomes a manufacturer. If he has a number of men working for him, it will require a part of his time to supervise the work of these men. Therefore he cannot himself make as many nails as formerly. His labor is not less valuable, but is directed into a different channel. As he cannot charge it to a certain lot of nails as he does the work of his men, he must distribute the value of his time in supervising the work to his manufacturing expense or overhead burden, and such part of his time as he actually works on nails to his labor account. He thus learns of the distribution of labor costs into the two accounts of productive and non-productive labor.

In the meantime, he has found certain machines will be of great assistance and enable him to turn out a greater number of nails. He purchases these machines. To pay for them he withdraws some money which he loaned at 5 per cent, and as he loses this interest, he must charge it to the business, so that this too goes into his overhead burden. He has now commenced to acquire equipment for his shop. These machines will need repairs at times and the amounts for this work will be for maintenance of equipment, and go into the same account. As the machines will probably last 15 years, with fair usage, at the end of which time he will need them as much as ever, he must set aside the money for new ones. With his limited knowledge, he divides the cost by 15 and takes this amount from his business each year for 15 years. This is his depreciation of equipment, and will be spent for renewals.

If he has purchased his shop instead of renting it, the interest on the money will be charged in lieu of rent. The purchase money will be a real estate investment, and he will have to incur another expense in keeping it in repair; which will be maintenance of real estate. With a considerable amount invested in building, machinery and materials insurance should be had. The cost of this is added to the overhead burden, as are also the taxes.

When he has a sufficient number of machines to make steam or electric power for driving them desirable, the cost of doing this will also be added to the overhead burden.

The manufacturer may now reason that there is profit in selling nails as well as in making them, and he will build a small store in front of his shop and sell a portion of his product himself. More capital is used in building and consequently there is another interest charge to be made. But he cannot charge it to the manufacturing accounts, as the selling problem is a separate matter and must stand upon its own merits. Not only so, but he has used a portion of the land belonging to the manufactuirng part of his business. The value of this must be assessed and the proper proportion of the interest transferred from the interest account for manufacturing to the interest account of the selling branch.

He has now become a merchant as well as a manufacturer, and must fit up his store. Possibly he has to borrow money for this and pay interest. This he must add to his fixed charges for the store. It should also be insured, both building and stock, and

[1]Tenth of a series of articles on "Shop Management and Cost Keeping."

this he must add to the same account. This store will be his sales department, and as it will be necessary to give a portion of his time to this part of his business, he should charge it to the cost of selling, or sales expense. The expenses and income of this department will be handled very much as the manufacturing accounts have been, with the difference that instead of his expense for material, he will charge his store with the finished stock of nails (the product of his manufacturing) and credit it with the income from sales. The difference between the two accounts will be the gross profit, from which must be subtracted the sum of his labor expense or clerk hire, etc., and his fixed charges or overhead burden, to get his net income, or profit.

By this time he has a number of different accounts and has learned many things about the various expenses incurred in manufacturing, and naturally wants to know more. He already knows that his product is so many nails in a month, and that they cost a certain amount; also that he receives a certain amount for them, and that by subtracting from the latter amount the costs of manufacture, he finds the profit on manufacturing for the month. But he makes a good many different sizes and kinds, and he knows that the costs must vary considerably, just as his prices do, so this does not satisfy him. He wants to know what one nail costs him, and he wants to know what one nail of a certain kind costs. His books do not give this information.

He will, therefore, begin a new lot of a certain number of a certain kind, and keep an accurate account of all material used and all the time spent on them. This proceeding appears all right for a time, but when a proper proportion of the manufacturing expenses or overhead burden is brought into the matter the question of what percentage of the total shall be charged to this particular lot of nails, or upon what basis he shall make this assessment, is a puzzling problem, and he cannot see just how it is to be solved. It is a question where complexity has produced perplexity, and our manufacturer is but one of many who have proceeded smoothly in cost keeping until they have reached this point. From here on each has his own method which he feels sure is not only nearer right than the plans advocated by his neighbor, but about the only plan that is properly adapted to his particular kind of business.

There are managers, however, who are not so sure of the correctness of their methods. They find that it is comparatively easy to determine the cost of material for a year, a month, or for any particular order. It is not a particularly difficult matter to account for the productive labor for certain definite periods, or on certain orders. But it is frequently quite a troublesome matter to determine satisfactorily just what the overhead burden has been, or how to distribute it equitably over the product that has been turned out, since this has been varied in character; some of it nearly all hand work, and performed by men ranging from a very low to a very high rate of pay; some almost entirely on machines; and more in which the machine work and hand work have been about equally divided. The manager knows that a cheap man occupies just as much space and frequently uses up more consumable tools and supplies, but turns out only half as much product as his high priced neighbor. He knows that machine work brings in an expense, interest and power account, that hand work does not, and so on, until the question becomes very complicated.

Frequently the first cause of this perplexity was that in organizing cost methods, the work was not begun at the outset of incurring expenses, but was entered upon months or years after beginning manufacturing, and many important factors were omitted from the calculations. The fact is that expenses begin as soon as we have determined that we will enter upon the manufacture of any article or machine. The preliminary stages will be: (a) to formulate plans for manufacturing; (b) to select a location for manufacturing buildings; (c) to erect the buildings; (d) to equip the buildings with machinery and a power plant; (e) to employ and organize a force of men with which to operate the plant. All these things and many others of more or less importance must be done and the consequent expenses incurred before manufacturing can begin.

It is true that from a mechanical point of view there is a great diversity of conditions and circumstances in manufacturing, brought about by the wide range in the kind of material to be worked up; the variety of product; and the kind and quality of labor that can be secured for the work, owing to local conditions. The plant may be designed to turn out a single product, the operations upon which are repeated day after day, with comparatively little change, and with a very narrow range in the ability required in the operatives who do the work. Or, it may be the building of complicated machinery requiring various classes and grades of employes from the day laborer to the highest class of machinist. While the one will require a moderate amount of supervision and moderate ability, the second calls for a high order of ability and the assistance of a mechanical engineering force of well trained men. Still another concern may be organized for the purpose of building a variety of machines and devices, which will require many skilled men of distinctly different classes, and superintending officials of quite as varied training, ability and experience.

In one case there may be required but a small number of different materials with which to carry on the business, the purchasing and handling of which is a simple matter. In another the range of different classes, grades and individual sizes may run up into thousands, and may require expert knowledge and labor in their purchase, care, issuing and accounting.

The question of labor may be quite as diverse as those of material and product. Usually unskilled labor may be easily obtained in all manufacturing localities. The presence of several manufacturing concerns in the same line will attract to the locality the needed labor in that line. If the work is such that a great diversity of ability and training is needed in the employes, the employment official must cover much more territory in his search for the workmen needed.

Such being some of the conditions by which the manufacturing problem is surrounded, it is not surprising to find that the plan or system that will answer the requirements of one case, or under one set of conditions, will be useless in another case which is subject to a different set of conditions, and positively harmful and misleading under certain other conditions.

We may study some of the more general conditions which are to a certain extent common to all; we may note the particular method by which an experienced engineer has solved these problems in certain cases; we may follow the plan through to its successful termination; but we shall not thereby be able to apply the proper solution to new conditions until we have learned the fundamental principles upon which accurate and successful cost finding is based, and until we are able to analyze the conditions as we find them and formulate systems

in conformity with these fundamental principles, keeping in view the analyses which we have made of existing conditions in their entirety.

In order to follow out the principles of this process in a logical and practical manner, assume that a company has been organized to conduct a manufactory, which shall include a machine shop, foundry, forging shop, pattern shop, and carpenter shop, and that there is an engineering department, a general office and a sales department. Previous to erecting buildings a preliminary engineering department has been organized and in a rented building worked out the general plans for manufacturing. The usual office accounts for this work have been kept, that is, the cost of equipment, supplies and salaries. This preliminary work having been completed, a location is selected, plans are drawn to conform to the various requirements of the manufacturing operations to be undertaken, the locality decided upon, and the buildings erected. The machinery for the generation and transmission of power, the machining of the work and the transportation of material, is purchased and installed. Material and supplies are purchased and the works started, and the product is being turned out and sold.

What principles are to be employed in formulating a correct accounting system for determining the costs of the product, and at the same time one that shall be harmonious with and a part of the general commercial accounting system of the entire business? A large number of separate and distinct factors must be taken into account in the final determination of costs, and to render the principles of their source, arrangement and method of handling clear, the following classification of accounts is given, commencing with the expense of acquiring the land necessary for the erection of the buildings of the plant.

TABLE OF CLASSIFICATION OF ACCOUNTS.

1. Real Estate.
   - Interest on the cost of land.
   - Interest on the cost of buildings.
   - Insurance on buildings and equipment.
   - Maintenance of land and buildings.
2. Floor Rate.
   - The sum of the real estate expenses divided by the area in square feet of the entire floor surface, gives the overhead burden on this account per square foot.
3. Power.
   - Interest on cost of equipment for the generation and transmission of power, and its installation.
   - Depreciation of equipment.
   - Maintenance of equipment.
   - Floor rate for space occupied.
   - Cost of fuel.
   - Sundry supplies.
   - Wages of engineers and firemen.
4. Light.
   - Interest on equipment.
   - Depreciation of equipment.
   - Maintenance of equipment.
   - Power necessary to run dynamos.
   - Sundry supplies.
   - Wages of electrician, etc.
5. Heat.
   - Interest on equipment.
   - Depreciation of equipment.
   - Maintenance of equipment.
   - Power, or equivalent horsepower in steam.
6. Shop Transportation.
   - Interest on equipment.
   - Depreciation of equipment.
   - Maintenance of equipment.
   - Power to run elevators, cranes, etc.
   - Wages of elevator men, shop car men, crane men, etc.
7. Machine Rate.
   - Interest on cost of each machine and installation.
   - Depreciation in value of machine.
   - Maintenance of machine.
   - Floor rate, including necessary space around machine.
   - Power to operate the machine.
8. Man Rate.
   - Floor rate, portion not covered by machine rates.
   - Consumable tools and supplies.
   - Liability insurance.
9. Productive Labor.
   - Wages of all men working on hand or machine operations on actual product.
   - Man rate, of surcharge or burden per hour.
10. Non-Productive Labor.
    - Wages of superintendents and assistants, foremen and assistants, gang bosses, time keepers, time study men, speed bosses, errand boys, clerks, stenographers, tool keepers, watchmen, sweepers, carpenters, inspectors, laborers, and others when on work not chargeable to production orders.
11. Material.
    - Castings, iron, malleable iron, steel, brass, bronze, etc.
    - Forgings, wrought iron, machine steel, cast steel, etc.
    - Bar Stock: iron, machine steel, cast steel, tool steel, high speed steel, copper, brass, bronze, etc.
    - Sheet Stock: iron, steel, copper, brass, fiber, etc.
    - Miscellaneous: all other kinds in use.
12. Tools and Fixtures.
    - Tools, jigs, gages and fixtures specially made for the purpose of machining, gaging and inspecting the product.
13. General Office.
    - Real estate charges.
    - Interest on equipment.
    - Insurance on equipment.
    - Maintenance of equipment.
    - Salaries of all officials, book keepers, stock keepers, clerks, stenographers, office boys, and all others employed herein.
    - Light, proportion according to number of lights.
    - Heat, proportion according to cubic feet of space to be heated.
    - Supplies of all kinds for use in the office.
    - Legal expenses, traveling expenses.
    - Telephone, telegraph and postage expenses.
    - Express and freight charges.
14. Sales Department.
    - Real estate charges.
    - Interest on equipment.
    - Insurance on equipment.
    - Maintenance of equipment.
    - Light, proportion according to number of lights.
    - Heat, proportion according to cubic feet of space to be heated.
    - Advertising, catalogs, circulars, etc.
    - Allowances, collections interest.
    - Legal expenses, traveling expenses.
    - Supplies of all kinds for use in the office.
    - Salaries and commissions.
    - Engineer's expenses, preliminary drawings and estimates.
    - Telephone and telegraph expenses.
    - Mailing expenses.
    - Express and freight charges.
15. Stable.
    - Real estate charges.
    - Interest on equipment.
    - Insurance on equipment.
    - Maintenance of equipment.
    - Supplies, hay, grain, etc.
    - Wages of stable men, truck men, etc.

The foundry will be considered as a separate manufacturing establishment and governed by the same principles as the main manufacturing building, except it will not have a sales department, the general sales department acting for it in case the foundry is to take outside contracts. It is, however, practical to consider the foundry as one of the manufacturing departments if so desired, but such a course will not be as convenient, as there are necessarily some peculiarities in foundry accounting and cost keeping that do not enter into the usual work of the machine shop, or other similar manufacturing departments. The pattern shop, forge shop, carpenter shop, etc., will be considered as departments of the manufacturing building, and the time, material and overhead burden charged to production orders when so employed.

The detailed methods and principles used in handling the different accounts in the above classification will be as follows, reference being had to their serial numbers:

1. The method of accounting for the real estate expenses is clearly shown in the first paragraph of the classification of accounts and its purpose is to devise means for properly and equitably distributing these expenses over the work of manufacturing the product.

2. The real estate expenses are footed up and the amount divided by the area in square feet of the entire floor of the manufacturing building, including that used for the power plant, that is, the engine and dynamo rooms, the boiler house, etc. This gives a burden or overhead charge per square foot, which is used in various ways as will appear.

3. The cost of power is determined by using the factors of floor rate, which takes care of the real estate account, the interest on the cost of the equipment, its installation, depreciation and maintenance, labor, fuel and supplies. The total of these expenses divided by the horsepower generated will give the cost per horsepower, the use of which factor will be shown later on. The question of depreciation of equipment should be based on the useful life of the machinery, which is supposed to have the benefit of a reasonable expense for its maintenance. If we assume that an engine or boiler will be worthless (except its scrap value), after 20 years, we must fix a percentage to be charged as depreciation, so that the first cost of the equipment and its installation, minus scrap value, shall be absorbed in 20 years. There comes in

here a fine question of the interest value of the money thus constructively set apart by this charging-off for depreciation process, which is known, but not usually recognized.

4. The cost of light is found by using the items of interest upon the cost of equipment, its depreciation and maintenance, the power required to run the dynamos, sundry supplies, and the wages of the electrician and other necessary labor. This total cost will be divided by the number of lights, reduced to the basis of 16-candlepower incandescent lights. The cost of arc lights is assessed as so many incandescent lights (according to candlepower), to equal one arc light. In this manner the cost of any number of arc or incandescent lights in a room or building may be readily determined.

5. The cost of heating is found by dividing the cost of interest, depreciation and maintenance of equipment, the horsepower or its equivalent of steam required, by the cubic feet of space to be heated, which gives a factor with which to compute the cost of heating any room of known dimensions.

6. Shop transportation cost is ascertained by the use of similar accounts of interest, depreciation, maintenance, power for elevators, cranes, etc. (reduced to horsepower rate), and the wages of elevator men, shop car men, crane men, etc. As this is a general expense the question of floor rate need not apply. That used for shop tracks may be absorbed in the man rate. The same method of ascertaining the cost of yard transportation can be used. The yard transportation cost should be divided between the manufacturing building and the foundry.

7. Machine rate or the price per hour to be charged for each machine is a mooted question, but should present no unusual difficulties. It is made up of interest on the cost of the machine and its installation, its depreciation and maintenance, the floor rate for the space occupied by it and the operator, and for properly handling the material upon which the machine works, and the power necessary to drive it. These costs will be reduced to an hourly rate for convenience in making up cost cards.

8. The man rate or surcharge will be another important factor in the cost of the product. From the entire floor area subtract that assigned to machines. To the remainder add the cost of consumable tools and supplies used by the men, and the cost of liability insurance. Divide this total by the number of productive men, and reduce it to an hourly rate, or basis. This apportionment should be made by departments, for the reason that in an assembling department, for instance, the relative area of floor surface per man will be large, while in a department equipped with a large number of machines the floor surface per man will be low. The cost will be assessed equitably, as in the first case the large man rate offsets the absence of a machine rate, while in the second there is a small man rate but also a machine rate.

9. By productive labor is understood the wages of all men who work on actual product, plus an hourly rate of surcharge as indicated by the term "man rate." This account will frequently include the work of some of the men usually engaged in non-productive labor, but temporarily working on a regular production order, or work which is properly chargeable to it.

10. By non-productive labor is understood all labor that cannot be charged directly to production orders, and must therefore be accounted for as a general expense. The term "non-productive" is a convenient, though not a correct one, since all labor is productive in some manner, and quite necessary. Its general and diffusive character puts it into a different account at the time, but it finally enters the productive account.

11. The term materials covers all raw, partly manufactured and wholly manufactured stock which actually go into the product. This will not include consumable tools and supplies. The insurance carried on material properly becomes a part of its cost. This may also be said of the labor of the men employed to receive, store, issue and account for it, but since it would be very difficult to equitably apportion this expense to the material in detail, it should be added to the general office expenses, and distributed as a percentage over the product.

12. The following plan would seem to be reasonable and equitable in accounting for the cost of tools, jigs, gages and fixtures. Fixtures and attachments made for a certain machine and capable of holding and machining different forms and kinds of work, should be considered as a part of the machine and added to its valuation. Regular tools suitable for work upon the regular line of work, as for instance, drills, taps, reamers, etc., will be considered as the regular equipment of the shop and the interest on their cost, together with the cost of maintenance, be added to the general expense. The cost of special tools, jigs, gages and fixtures, should be charged to the order of such lots of parts, or machines as may be made on a contract. If used regularly, upon a regular line of work in manufacturing, they may be charged to the general expense account, and are consequently a part of the overhead burden.

13. The general office expenses are shown in detail in the classification above. Real estate charges are interest on cost of land and buildings, insurance, and the maintenance of both land and buildings. The other items in the list require no further explanation. These costs will all go into the general expense account and are therefore a part of the overhead burden.

14. The sales department will occupy a part of the general office building and be assessed with a proper proportion of the real estate charges according to the space occupied. Its other expenses will be disposed of as noted in the classification of accounts, from which it will be seen that there is a large range of accounts forming the expense of selling the manufactured product.

15. The stable expense will be the real estate charge, interest on equipment and the cost of maintenance, supplies of hay, grain, etc., and the wages of the stable men and truck men. As the work of this department is of such a diverse nature its cost will go into the general expense account and become a part of the overhead burden.

The cost of the manufactured product is found by adding the three factors of material, productive labor and overhead burden.

Material will be charged at its market cost.

Productive labor will consist of the wages, the man rate or surcharge, and the machine rate, in case the work is done on a machine.

For overhead burden, there should be added on a percentage basis to the cost of the work, i. e., the material and productive labor as above, all general expenses, consisting of non-productive labor, shop tool account, shop and yard transportation, insurance on material, general office and stable expenses. The entire amount will constitute the total factory cost.

In the same manner we assess to the total factory cost a percentage of the expenses of the sales department,

that is, the entire expense of maintaining the sales department distributed over the entire product. This will give the total commercial cost. To the cost thus found we add a percentage for profit, and thus obtain the selling price of the product.

The most convenient method of handling general expense accounts will be to make them up monthly and assess them as a percentage upon the month's product. Generally these percentages will not vary greatly from month to month, and in many cases it will be sufficiently accurate to use the previous month's percentages for the burden of the current month's product. This will permit costs to be known promptly, and enable the managing officials to keep in closer touch with the present costs of manufacturing operations, in a general way, and what is often of more importance, of departmental costs.

Inter-departmental accounts should receive careful attention. This will be more particularly the case with the engineering department, tool room, pattern shop and carpenter shop, and should be adjusted substantially as follows: The work of the engineering department (including what is generally known as the drafting room), will be upon preliminary drawings and estimates for the sales department, which should be charged to that department. Detail drawings and designs for special tools, jigs and fixtures for contract work will be charged to the orders issued under the contract. Drawings for general tools, attachments, etc., will be charged to tool equipment of the manufacturing departments generally. Drawings for new buildings or for alterations and improvements on existing buildings will be charged to the real estate account.

The work of the tool room will be charged in a similar manner to that of the engineering department, a careful distinction being made between new work and that for repairs and maintenance. It must not be forgotten that while repairs and maintenance of tools are an expense, new tools, jigs and fixtures are an asset. One goes to general expenses and the other goes on the inventory.

The same may be said of the work of the pattern shop. Repairs, maintenance, patterns for temporary use, etc., are expense accounts. Patterns made in executing a contract for castings are charged to the customer and become his property, while stock patterns regularly used in turning out the product go on the inventory as an asset.

The carpenter work necessary to keep grounds and buildings in repair will be charged to maintenance of real estate, while the building of new structures or permanent additions and improvements of existing buildings will add to their value and become an asset. Boxing, crating, etc., for shipping will be charged to the sales department.

The work of the stable force and the expenses attending it being diversified and employed for nearly all departments of the plant, will be quite equitably distributed by making it a part of the general expense.

In seeking to formulate a plan and put it into practical operation for the carrying out of the principles laid down above in an existing business, there will be various obstacles encountered, some natural and expected, and some unexpected because seemingly unnatural and unreasonable. The necessary changes of system will be somewhat in the nature of a revolution in many establishments and consequently meet with more or less opposition. The average manager is reluctant to furnish the necessary data on either the past or the present condition of the business. This may result from a personal desire to thwart the wishes of some higher authority, but it is more likely to be the case that he does not have the desired information, and such data as he has he is not at all sure of, when he realizes that conditions are to be thoroughly examined, compared and analyzed.

The writer's experience in such cases is that such information as can be produced is of a very indefinite character, and that the costs calculated by the average "ready made" or "home made" systems are far from the truth. In fact, they are frequently so palpably incorrect that an expert can make an off-hand estimate that will come much nearer being correct. This condition is the result of a number of failings in the manager's formulation of his cost system. Among these failings, the most prominent are the following: To take all the preliminary factors into consideration; to consider these factors in their true condition and proper value; to collect accurate data to manufacturing operations under their supervision; to analyze and calculate the available data at their proper value and importance; to compare the data obtained with the records of past performances; to secure from the data available and the conditions manifested, the real benefit of, (a) an increased output at a decreased cost; (b) the elimination of unprofitable business; and (c) the opportunity to secure an increased volume of business by a judicious lowering of the prices of the product. While all of these failures may not be found in one plant, one or more, and usually a majority of them will appear upon a careful investigation of manufacturing and accounting methods.

The establishment may have lost money, but the manager has not been able to tell where and when or how this loss has occurred. Yet this is one of the most important requirements of a cost system. While there are ample opportunities for losses at any point in the manufacturing operations, and while many of them occur in the handling and machining of the parts, these should be looked after by the superintendent, and it is the manager's duty to keep in close touch with these conditions. The losses traceable to incorrect and indefinite methods of handling the overhead burden accounts will be many and difficult to locate and eliminate. If we can determine where the burden is too high, and why it is so we shall have gone a long way toward solving the entire problem. Yet it is not impossible or impracticable to do this if we carefully compare all of the costs, general and special, of the entire plant, and of each department, month by month, and show the results upon graphic diagrams or charts, which will tell the story so p lainly and forcibly that no manager can fail to see and to remedy the faults.

While all these complicated conditions may be very perplexing to the average manufacturer, it is entirely possible, with the co-operation and advice of men trained in this branch of mechanical and technical investigation and accounting, to secure within a reasonable time and with an economical expenditure, the important results desired.

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The Pressed Steel Car Co. has announced that it will anticipate the payment of $500,000 bonds, due Feb. 1, 1909, by taking up that amount before Aug. 1, this year, thus reducing the total issues outstanding to $1,000,000. These bonds were a part of the original issues in 1901 of $5,000,000, of which $500,000 was to be redeemed annually.

# A NEW 20-INCH HIGH SPEED SHAPER

The accompanying illustrations show a new 20-inch high speed crank shaper built by Walcott & Wood Machine Tool Co., Jackson, Mich. The machine possesses a number of unusual features which are of considerable interest. The first departure from accepted practice is in the shape of the ram bearings which are shown in Fig. 1 and also at A in Fig. 3. The ram is provided with a flat bearing underneath and with a wide side bearing, tapering slightly upward and outward. The top bearing tapers upward and inward. The column is provided with recesses to accommodate the ram bearings, which are cast in the solid metal of the column. Taper wedge gibs B are provided to take up wear. The ratio of the lower bearing to the side bearing is so calculated that the ram will wear downward in its bearing, and owing to the tapered side bearings the lateral wear is automatically taken up. With the ram in position and the wedge gibs in place the ram bearings are virtually surrounded on three sides by the solid metal of the column, producing an extremely strong construction. This construction also eliminates any tendency of the ram to wedge under the upward pressure of a heavy cut, which produces uneven work and chatter marks.

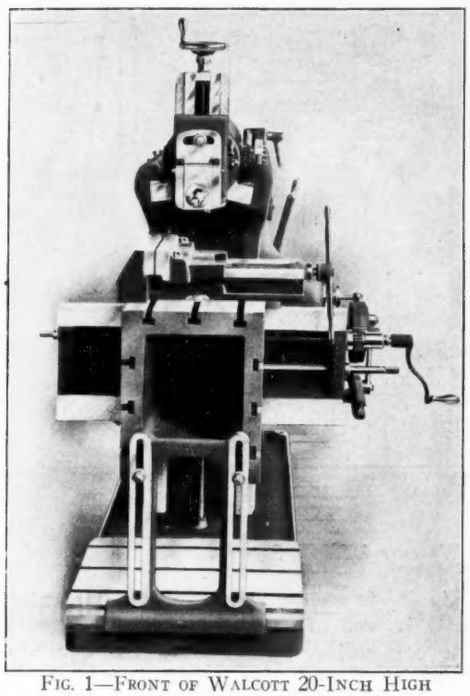

FIG. 1—FRONT OF WALCOTT 20-INCH HIGH SPEED SHAPER.

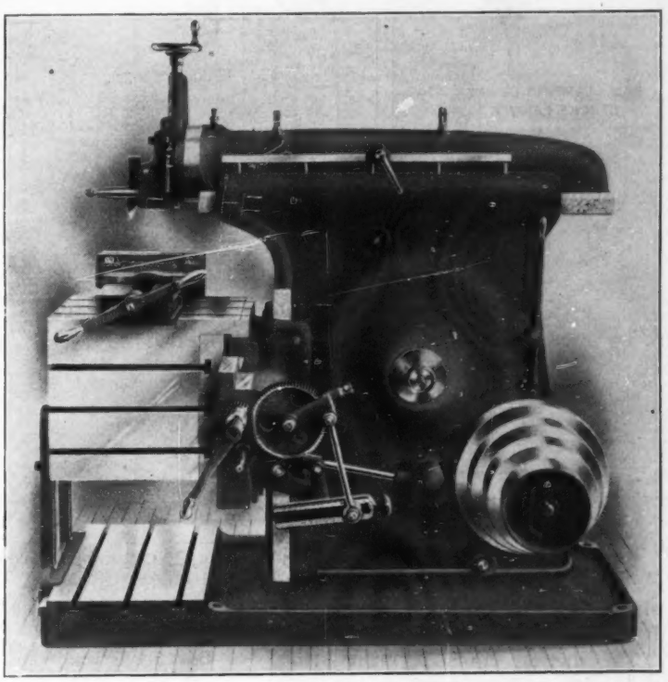

FIG. 2—DRIVING SIDE OF WALCOTT 20-INCH HIGH SPEED SHAPER.

Another improvement in the ram has been the elimination of the long slot usually provided to accommodate the clamping stud. This is done by placing the clamping device for binding the ram to the rocker arm entirely within the shell of the ram. The ram is made of box form with an unbroken outer surface and is strongly cross ribbed at short intervals throughout its entire length. The binding device is operated from a wrench hold C projecting through the top of the ram. The constructon of the clamping arrangement is shown at D, Fig. 3. The inner surface of the ram is provided with two projecting ribs E engaging the positioning nut F. The lower end of this nut is cut away and a clamping plate G is provided, being so constructed as to bind upon the ribs E and the positioning screw H at the same time. The actual clamping is done by means of the eye-bolts 1 and the eccentric lever 2, which is operated by the rack 3. This in turn is operated by the pinion 4 at the inner end of the wrench hold C.

The tool head is of the usual design, is graduated and swivels to any angle through an arc of 90 degrees. It has an adjustable collar graduated to 0.001 inch on the down feed screw. The tool head slide has a graduated scale and adjustable pointer to indicate the depth of cut. The clapper box is strengthened by a rib J connecting both sides at the bottom and greatly increasing the rigidity. The tool head is provided with a strap tool post.

The down feed mechanism consists of the rail 5 mounted on the top of the column and of the dog 6 adjustable along the rail and provided with a projecting pin 7, which engages with a slotted lever 8. By this means a positive motion of the lever is obtained in both directions eliminating any spring arrangement to return the lever. The lever 8 is connected to the feed screw by suitable gearing as shown and by the ratchet 9, which can be engaged at will.

The main drive comprises a four-step driving cone L Fig. 4, running on the outside of a stem cast solid with the column. A double sliding gear 10 is mounted on the cone shaft 11 and back gears on the shaft 12 connect with the bull gear 13. On the other end of the bull gear shaft is an elliptical gear 14 meshing with a second elliptical gear on the driving crank 15. The drives give eight cutting speeds with each length of

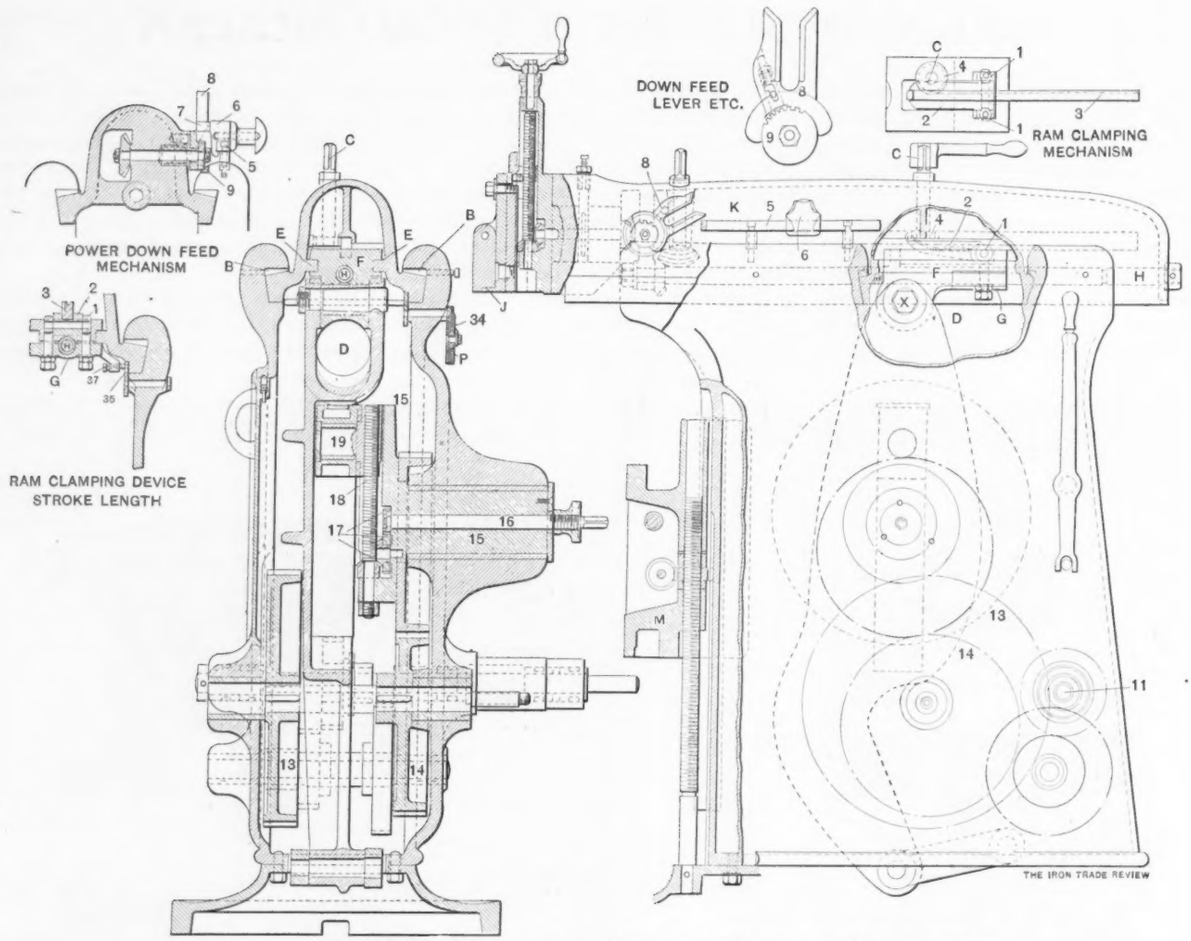
POWER DOWN FEED MECHANISM
RAM CLAMPING DEVICE STROKE LENGTH
DOWN FEED LEVER ETC.
RAM CLAMPING MECHANISM
THE IRON TRADE REVIEW

FIG. 3—FRONT SECTION, ELEVATION AND DETAILS OF WALCOTT & WOOD SHAPER.

stroke and the ratio of back gearing is 32:1.

The driving crank is made strong and with a long bearing cast solid with the column as shown in Fig. 3. Adjustment of the stroke is obtained by means of the shaft 16 passing through the center of the crank and gears 17, which turn screw 18 and adjust the nut and crank pin at 19 so as to alter the length the desired amount. The rocker arm is made of unusual length so that when the ram is at the extreme end of the stroke it is less than 15 degrees from the perpendicular. The recess for the crank block is of box form and is provided with a taper gib to take up wear. The rocker arm is forked allowing shafting to be passed through under the ram for cutting keyways.

The cross rail is shown at M. It is of box form and designed to permit heavy cuts. Referring to Fig. 4, the cross rail bearings 20, on the front of the column are made with the outside bearing at a slight angle to take up wear. The cross rail is long and deep and is provided with wide bearing surfaces for the apron, which is provided with a taper gib 21 for taking up wear. The table O is of box form and can readily be detached to provide for clamping work to the face of the apron. The table is locked to the apron as shown in Fig. 2 and is also provided with an ample outer support.

An interesting feature of this machine is the means for obtaining cross feed to the table. No adjustment is necessary to make the feed mechanism correspond to the height of the cross rail. The details of this arrangement are shown in Fig. 4 and consist of the miter gears 22 and 23 and the splined shaft 24. These transmit motion from the bull gear shaft 25 to the crank 26. This, through the connecting rod 27, actuates the rocker 28, which is provided with an adjusting screw and trunnion nut, the latter connected by means of the rod 29 to the ratchet lever 30. This lever is mounted on a stud in the cross rail and operates the gear 31 and in turn pinion 32 loosely mounted on the cross rail. This pinion is connected to the cross screw and is capable of sliding on it. If the table is accidently run over to the extreme end of its travel the pressure on the spring clutch forces the clutch out of mesh with the ratchet and prevents any breakage. For convenience in adjusting the length of the stroke, an index is provided which shows the length of the stroke. This is shown in detail in Fig. 3, being at P. It is in the form of a dial provided with a pointer oscillating over the face of the dial and driven by suitable gearing from a rack actuated by a screw passing through a lug in the positioning nut.

All bearings are bushed with bronze bushings and all rapid running bearings have ring oilers. The construction of the ring oilers is shown in the detailed view in Fig. 4. All bearings on the driving cone are lubricated by means of the splasher shown, which throws oil upon them.

The vise is designed to set solid on the flat top of the table and is graduated and provided with a swivel base. Shafts are of carbon steel, ground to size and all gears are cut from the solid with coarse pitch and wide face. All pinions are also of

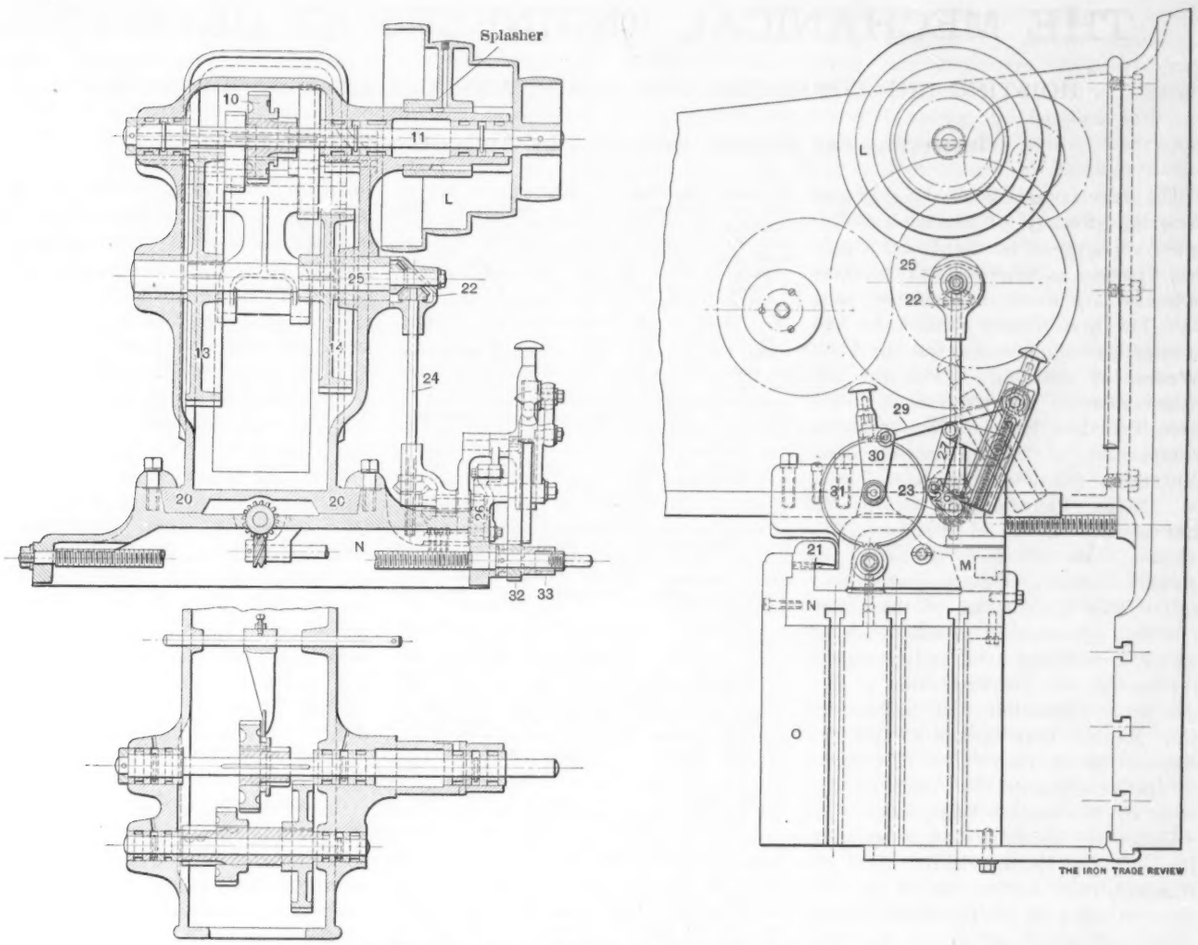


FIG. 4—DRIVING MECHANISM OF WALCOTT & WOOD SHAPER.

steel. The principal dimensions of the machine are shown in the following table:

| | | |
|---|---|---|
| Maximum stroke | 20 | inches |
| Horizontal travel of table | 27 | inches |
| Length of ram bearing in column | 36 | inches |
| Keyseating capacity | 3½ | inches |
| Down feed to head | 7 | inches |
| Ratio of gearing | 32:1 | |
| Net weight of machine and counter | 4,100 | pounds |

## WILL MANUFACTURE ALLOYS.

The American Manganese Bronze Co., 99 John street, New York City, is a new concern organized for the manufacture of high grade alloys. It has purchased a site of two acres at Holmesburg Junction, within the corporate limts of Philadelphia, where it has erected a model foundry building, equipped with electric traveling cranes, pneumatic devices and other arrangements for economical production, a metal storehouse, coke bins, office building, etc. U. T. Hungerford, president of the company, is a well known figure in the brass and copper industry. C. R. Spare, vice president and general manager of the works, was for a number of years chief engineer of tests of the Wm. Cramp & Sons' Ship & Engine Building Co., where he made a specialty of manganese bronzes. W. A. Locke, secretary and treasurer, was for 20 years connected with the brass and copper business, and W. A. Taylor, superintendent of the foundry, was identified with the production of the first manganese bronze made at the Cramp works 18 years ago. H. A. Wilson is assistant secretary.

Spare's manganese bronze, which the new company is prepared to furnish either in ingots, billets, bars, castings or forgings, is a homogeneous alloy possessing a tensile strength of upwards of 70,000 pounds per square inch, an elastic limit of about 35,000 pounds, elongation of nearly 25 per cent and a reduction of area of about the same figure. It can be forged or rolled at a bright cherry heat, is of close, even texture, is highly non-corrosive, does not crystallize when subjected to vibration, and does not segregate in remelting. Its extreme fluidity in a molten state permits of the production of intricate castings true to pattern; these require no annealing and are easily machined. In the company's foundry castings can be made up to 20,000 pounds.

Spare's white bronze, another product, is a bearing bronze combining remarkable anti-frictional properties with a high melting point and an elastic limit in compression of over 5,000 pounds per square inch, rendering it particularly desirable for use where extreme conditions of friction, concussion and pressure are to be met. The company also manufactures Spare's hydraulic bronze castings, United States government compositions, special automobile bearing bronze and other high grade alloys.

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The plant of the A. A. Griffing Iron Co., Jersey City, N. J., which was recently sold at chancellor's sale to the Hematite Products Co., has been transferred to the American Radiator Co., by which it will be used as a warehouse. The Griffing company has been in the hands of a receiver since early in March. It is stated that the purchase price, $110,000, will more than cover the liabilities.

# THE MECHANICAL ENGINEERS AT DETROIT

## HOISTING AND CONVEYING, AND GAS POWER THE LEADING SUBJECTS

### Interesting and Spirited Discussions by Authorities in Their Fields

The regular spring meeting of the American Society of Mechanical Engineers convened in the Hotel Cadillac, Detroit, as briefly noted in these columns last week, on Tuesday, June 23. The first regular session for the transaction of business was held on Wednesday morning. After the announcement of the election of members, President Holman announced the composition of the nominating committee, as follows: Chairman, James M. Dodge, Philadelphia; George H. Barrus, Boston; F. M. Prescott, Milwaukee; Mr. Shepard, Denver, and Newell Sanders, Chattanooga. Secretary Rice then spoke of the simultaneous sessions of allied societies which were being held, and welcomed the Society for the Promotion of Engineering Education, the Society of Gas Engine Manufacturers, and the Association of Automobile Engineers to the sessions of the American Society of Mechanical Engineers.

Under the heading of new business, Prof. F. R. Hutton stated that the standard code for testing of gas engines as adopted by the society some years ago was now out of date and that recent developments in the art had made inexpedient its use. He moved that the subject be referred to the council with power and that the council request the gas power section of the society to undertake a revision of the code in order to bring it in line with modern practice. President Holman, speaking on this subject, suggested that the committee, in the code revision, put the performance of all engines, both internal and external combustion, on a B. T. U. basis. This is the only proper basis for duty tests of engines, as it is the only means by which engines of dissimilar types can be compared with each other.

The papers of the morning formed a symposium on hoisting and conveying machinery, and as they were all on similar subjects, they were read together, and the entire subject discussed as a single paper. Abstracts of the papers follow:

#### Symposium on Hoisting and Conveying.

*HOISTING AND CONVEYING MACHINERY. By George E. Titcomb.* This paper describes present day facilities in the mechanical transfer of materials—especially coal and ore—to and from shipping points and storage. The illustrations assist to an understanding of the development of an industry due to conditions in which magnitude of installation as well as operative economy, must be considered. The summary shows the intermittent class of raw-material conveyors, including open-air and covered coal storage apparatus, traversing and revolving bridge-tramways, locomotive cranes, hoisting towers, and telphers.

*THE CONTINUOUS CONVEYING OF MATERIALS. By Staunton B. Peck, Chicago.* The scope of this paper covers only the conveying of materials by continuous machines, as this industry is a development of the last 30 years. It has been necessary to do much experimental work in that time, and much is yet to be done. There has been little published information on the subject, and the general tendency has been to let initial cost be the guide in selecting conveyors. Nevertheless there is a wide diversity in design and details of this machinery, and improper selection may result in a very successful installation, a moderately successful one, or a failure. The aim of the paper was to give a general idea of some of the types of conveyors in use, with data as to their adaptabilities, capacities, power consumed, and economies effected.

*THE BELT CONVEYOR. By C. Kemble Baldwin.* This paper aims to acquaint engineers who are designing plants, with the possibilities of the belt conveyor for handling heavy abrasive materials, and to give data which will be of service in the preparation of preliminary designs. The author believes the following claims for this type of conveyor to be well based: 1. Large capacity with low power requirements. 2. Small maintenance charges. 3. Freedom from breakdown. 4. Light weight of mechanism for large capacities. 5. Material carried comes in contact only with the belt. 6. Perfect alignment not absolutely necessary. 7. Can be made up into light portable sections. 8. Large overload capacity.

Local conditions have an important influence on the choice of the proper width and character of belt, general arrangement of conveyors, etc., and on these matters the specialist should be consulted.

*CONVEYING MACHINERY IN THE PORTLAND CEMENT PLANT. By C. J. Tomlinson.* Standard forms of conveying machinery have been adopted. Their advantages are low first cost, continuous and automatic operation; their disadvantages, rapid wear, low mechanical efficiency and lack of proper measuring arrangements. Conditions in these plants are such as to test these devices to their utmost, and results indicate that a heavier, more simple device should be adopted, and one that includes convenient means of recording the performances of the machinery served. Devices similar to the blast furnace skip-hoist and scale transfer car are suggested, which, however, involve radical changes in the design of the plant.

#### Hoisting and Conveying Discussion.

In discussing Mr. Peck's paper, Mr. Patterson stated that the author had not said enough about certain machines which he illustrated in his paper. Illustrations were published concerning which no data were given, and the inference was that this machinery was of not so great importance as the machinery described in detail. Mr. Patterson gave the particulars of the performances of the "Brownhoist" ore unloaders at Conneaut, O. He told of six machines at Fairport, O., which after one and a half month's use, had averaged 258 tons of ore per machine, per hour. Similar machines at Cleveland, operated in connection with ore weighing devices, could handle a carload of ore even more rapidly. The speaker dwelt on the importance of this feature inasmuch as dock companies and railroad companies are laying great stress on the exact weighing of ore as it is unloaded. Mr. Patterson criticised the omission of reference to bituminous coal handling plant at this dock, inasmuch as the anthracite plant was only one-fifth the size of the bituminous plant. The speaker favored the use of larger units in coal unloaders and also the use of man trolley equipments. This latter feature is desirable as the man is always with his work, and that long whip lines are unnecesary as in other types of machinery. Speaking further of the capacity of the bituminous coal handling plant at Superior, he stated that the fast plants at this point had a capacity for unloading coal at the rate of 150 tons of coal per hour, per machine.

G. B. Wilcox, discussing Mr. Baldwin's paper, cited an instance where 1,100 tons of salt had been handled in 10 hours by a belt used for loading ships. For handling this material in large quantities, the belt conveyor gave good results, but with small quantities, the results were rather unsatisfactory. Salt is very sensitive to weather conditions when handled by belt conveyor, dampness in the atmosphere interfering greatly with the work.

Charles M. Piez gave a thorough and detailed discussion of Mr. Baldwin's paper. He described the construction of the original belt developed by Mr. Robbins for conveyors, and showed how it was designed for the purpose of forming a deep trough to give large capacity. This necessitated changes in the construction of the belt from standard practice. The deep trough developed defects, and the form of construction of the belt sacrificed strength to capacity; high initial tension was needed in order to obtain a satisfactory drive. The result of this tension was to break the bond between the rubber and the duck composing the belt. The obvious remedy, said Mr. Piez, was to adopt a shallower trough, which would result in a reduced tension.

#### Form of Idler.

Mr. Piez called attention to a form of idler shown in Mr. Baldwin's paper

which used four pulleys. This idler allowed the belt to resume a shallow trough, and permitted the use of a standard belt of uniform ply, and marked an advance in the art. Mr. Piez then called attention to the recent type of idler shown in Mr. Peck's paper, which consisted of three pulleys mounted on one shaft, the center one being cylindrical, and the two outer ones of approximately conical shape, giving the belt a very slight trough. This idler also marked an advance in belt conveyors, as but a slight trough was needed to hold the material on the belt. The only legitimate criticism that could be made of this idler is the slip between the belt and the outer ends of the larger rollers. He doubted very much if standard idlers, as shown by Mr. Baldwin, were free from slip. Inasmuch as the no-load readings of power consumption were from 90 to 95 per cent of the full-load readings, it is evident that the idlers lag under a light load, and probably under full load. The idlers shown in Mr. Peck's paper were no more destructive of the belt than those shown by Mr. Baldwin, and in many cases would not be so hard on the belt. Belts were principally worn on the carrying side, due to impact of the material and the improper design of the drive. Too little stress is laid by many designers on the diameter of the driving pulley. The governing factor in the design of drives should be the number of plies in a belt, and not the width of the belt. The drive pulley should be not less than 8 inches diameter per ply of belt, and the belt should make but few turns under stress, and should avoid reverse curves. Mr. Piez stated that the drive on a belt conveyor should always be located at the head of the machine. Mr. Baldwin's formula for the power required to drive belt conveyors was sharply criticised by Mr. Piez. He compared it with results of actual tests made by him which showed wide discrepancies between the formula and the actual power consumed. He said that the formula was of but little value for general use, although it might prove of assistance to a man familiar with belt conveyor work, and the conditions under which they were installed.

### Resistance of Conveyor Materials to Impact.

Mr. Bennett presented the results of experiments made to test the resistance of different types of conveyors as to the impact of materials falling on them. The materials from which various conveyors are manufactured were subjected to 45 minutes' action of a sand blast under the same conditions. The figures in the following table show the relative amounts to which the substances were abraded by the sand blast, taking rubber as unity:

| | |
|---|---|
| Rubber | 1 |
| Steel | 1½ |
| Cast iron | 3½ |
| Balatta Belt | 5 |
| Woven cotton belt, first quality | 5 |
| Stitched cotton belt | 8 |
| Woven cotton belt, ordinary quality | 12 |

Another speaker stated that the tension of the belt was a more vital factor in designing the drive than any other consideration. That the relation of $T_1$ to $T_2$ was more important in belt conveyor work than in transmissions.

H. S. Riddle called attention to the fact that many persons designed their own conveying plants and gave no heed to the experience of people who had devoted years to the business and had accumulated a large amount of data and experience, and that many conveyor troubles were due to neglect of these data and experiences.

### Tribute to Messrs. Dodge and Hunt.

Mr. Peck, at the conclusion of his paper, paid a high tribute to James M. Dodge's fine work in connection with the development of conveying machinery, and in particular spoke of Mr. Dodge's work in designing the equalizing gear. Mr. Dodge at this point rose to remark that the equalizing gear had first been designed by C. W. Hunt, and that the reason he had designed an equalizing gear was because he could not use Mr. Hunt's. Mr. Dodge paid a most glowing tribute to the work of Mr. Hunt, stating that the latter gentleman had set a standard for splendid design and high-class workmanship in conveying machinery, which his company had for years taken as an example to be followed. Mr. Dodge's remarks were greeted with hearty applause, and it was especially noteworthy that this tribute should be paid by one manufacturer to another who is one of his keenest competitors.

### Cement Mill Conveyors.

Prof. R. C. H. Carpenter discussed Mr. Tomlinson's paper on conveyors in cement mills. He stated that more troubles arose in the cement industry from bad conveying machinery than from all other causes put together. Standard conveying machinery, he said, was of little use in a cement plant, and that a conveyor, to have any life whatever, should be designed much heavier than usual, or the maintenance costs would be almost prohibitive. The belt conveyor had proved unsatisfactory, and about 90 per cent of the work in cement plants today is being handled by screw conveyors. Even this machinery, however, was designed heavier than usual. Large material cannot be handled satisfactorily, however, by screw conveyors, but it is necessary to break it down to pieces of about ¼-inch size. The speaker described Mr. Hunt's wire rope haul, extensively used in Portland cement industries, which comprises a cable to which are attached cars at suitable intervals. This machine was reliable, and its maintenance cost was low. In answer to a question in regard to the loading of screw conveyors, Prof. Carpenter stated that they should not be loaded to a depth greater than one-half the radius of the flights.

E. S. Fickes described a conveyor for handling finely divided material, comprising a cylinder with helicoidal vanes on the interior. The material flows forward spirally as the cylinder is rotated. This conveyor can be built of rolled steel pipe for small sizes, but plates are necessary in its construction in the larger sizes. Transfer stations are installed at the corners where the direction of movement of materials is changed. This type of conveyor is in use in chemical works for handling lime and soda ash, or dusty or hot material. When the latter is carried, however, it must be lined with fire brick. It is not adapted to use with damp materials.

E. G. Thomas discussed Mr. Baldwin's paper, and described a conveyor wherein the ordinary pulley idlers were replaced with an idler composed of a spiral spring suspended so as to give an approximately semi-circular form to the belt. The spring was designed so that it had an extreme fiber stress of about 15,000 pounds per square inch and gave the conveyor about the same cross-sectional area at full load as would a 35-degree, 3-pulley idler.

### Conveying in Railroad Work.

Prof. H. Wade Hibbard spoke of the importance of conveying and hoisting machinery to railroads. He emphasized the fact that reliability was one of the prime requisites of a conveyor or elevator in railroad work. It is an absolute necessity that the coal supply for locomotives should not fail, and that to this end it is sometimes advisable to go back to more primitive methods, such as an inclined trestle, rather than depend on expensive machinery which could possibly fail at a critical time. He rather sharply criticised a coaling station shown in Mr. Titcomb's paper, where-

in there was but a two-days' supply for the locomotives. It was easily conceivable, he said, that a failure could occur in the machinery, which would put the coaling station out of business for considerably more than two days with disastrous results to the railroad. In his closure, Mr. Titcomb replied to this point, stating that the machinery was in duplicate and run on alternate days. It was inconceivable that an accident could put both sets of machinery out of business. The station in question was installed at the St. Louis terminal and had handled the World's Fair traffic without a single delay.

### Water as a Conveyor.

Another speaker called attention to the fact that the greatest conveyor in nature had not been mentioned, and pointed out the erosion of land by rivers as an instance of the great possibilities in the use of water as a conveying material. He instanced the use of the suction dredge in this manner, and said that material taken up by the dredge was transported long distances through pipe lines, to the spoil bank, the cost of handling being as low as 11 cents per cubic yard. Mr. Suplee stated that the removal of ashes from shipboard was an instance where water was used as a conveyor, the water being handled by a steam ejector, and the ashes being pumped overboard by this means. Prof. William Kent also stated that the late President Andrews of the New York Steam Co. had carried on experiments on the transportation of anthracite by water and had, about the time of his death, evolved a scheme for transporting coal from the mines in Pennsylvania to the company's plant in New York in a series of pipes. Dr. Kent inquired if there was not some record of this work, and whether any practical results had been obtained from the experiments.

This closed the discussion, and the various authors replied briefly to the points which had been brought up.

### Baldwin Replies to Piez.

By some inadvertence Mr. Baldwin's closure was overlooked, but was presented at the afternoon session. In his closure Mr. Baldwin stated that the formulae in his paper were the results of six years' experiments, and have been in use for four years, and have proven themselves time and again. On this point he took sharp issue with the statements made by Mr. Piez in the morning. He admitted the redesigning of the original idlers developed by him and Mr. Robins, and said that they were proud of it; that a concern was not progressive if it did not redesign its machinery from time to time, in the light of new developments. He did not lay as much stress on flat belt conveyors as did Mr. Piez, having heard of but one new installation of this type in two years. He denied that there was a slip between the idlers and the belt with the ordinary form of grease lubricated idlers, again taking issue with Mr. Piez. He also stated that small pulleys were not injurious in the drive, and cited an instance of a conveyor using a 48-inch drive pulley in connection with a nine-ply belt. In the three years it had been installed this conveyor had handled 1,250,000 tons of material and was still in good condition. Mr. Baldwin repeated his assertion that the drive could be located at any point on the conveyor.

### Wednesday Afternoon Session.

The Wednesday afternoon session was devoted to a variety of subjects, papers on superheated steam, piston design and journal friction being presented.

### The Thermal Properties of Superheated Steam.

Prof. R. C. H. Heck read a paper on the above subject. A graphical comparison was made of data from experiments of Knoblauch and Jakob and of Thomas upon specific heat of superheated steam under constant pressure. This showed a marked difference near the point of saturation. The author explains conditions at this point and finds evident errors in interpretation by Knoblauch and Jakob. Views are given of the critical state of water and a new interpretation is made of Knoblauch and Jakob's results, bringing them into essential agreement with the work of Thomas. The author treats of the higher range of superheat, referring to experiments of Holborn and Henning, and gives a combination of data derived graphically showing the probable manner of variation of specific heat.

Prof. H. N. Davis discussed Prof. Heck's paper and stated that Knoblauch and Jakobs were in disagreement in that Thomas's temperature values were higher than Knoblauch's, while in the region of superheat, Thomas curves do not pass a minimum and rise as Knoblauch and others believe that they should. Changes in the properties of superheated steam close to the saturation line have been reported before by other experimenters. Thomas started his experiments with wet steam and endeavored to determine by means of a thermo-couple where superheating begins. This method is liable to gross errors, inasmuch as water can be held in suspension in superheated steam, as has been proven by Knoblauch and Jakobs. Mr. Heck's values of C close to the saturation line are too high, but the resulting errors in the total heat are small. Prof. Davis said that it was reasonable that C for water and saturated steam should increase indefinitely as the critical point is approached, and that recent measurements of liquid sulphurous acid confirm this. However, Knoblauch's curves for saturated steam are too steep, and Prof. Heck's lower curves are better.

President Holman remarked at this point that the treatment of this question by Prof. Rankin was the correct one, namely, considering steam gas. Mr. Suplee confirmed this, saying that the steam gas idea is very pertinent at the present time, as steam gas is being used in gas turbine work. To lower the temperature, steam is injected into the gas and transformed to gas by the burning of the combustible gas.

Dr. H. T. Eddy said that Professor Heck has made in this paper an illuminating comparison of the experimental results arrived at by Professor Thomas at Cornell and by Knoblauch in Germany. It occurred to Dr. Eddy to take the experimental results of these investigators and carry out the comparison in a different manner, by the help of the lines of total quantity of superheat used by Prof. Thomas. Contrary to the conclusions reached by him, Dr. Eddy found that Thomas's own data show that within the errors of observation those lines are all convergent straight lines passing through a single point whose coordinates in terms of pressure and superheat are 34 pounds and 14.5 B. T. U., at least for all that region of superheat included within the range of ordinary practice, except perhaps between 0° and 18° of superheat, where sufficient experiments are wanting. This fact permits the total superheat to be expressed algebraically as a linear function of the degrees of superheat.

Knoblauch's experiments were also represented upon the diagram of lines of total superheat, thus showing their close agreement with those of Thomas; and further the fact was made evident that the specific heat of steam at saturation given by both these experimenters is entirely conjectural. A new form of graphical

diagram of the properties of superheated was also exhibited by Dr. Eddy, in which the state of superheat being given by its pressure and temperature as co-ordinates the lines showing constant values of the specific heat, mean specific heat above saturation, specific volume, total heat contents, total quantity of superheat, and entropy and enable their numerical values to be read at once from the diagram, thus furnishing a complete set of tables of these magnitudes. The diagram as exhibited was based on Knoblauch's experiments. A similar diagram will be constructed on the basis of the above mentioned straight lines of total quantity of superheat as found by Thomas.

### A Rational Method of Checking Conical Pistons for Stress.

This paper by Prof. George H. Shepard develops a rational method for calculating the stress in a conical piston at any point. A formula is deduced for the stress, which strictly applies only to pistons of the same form as shown in the figures accompanying the paper; but the method would be applicable to a conical piston of any form. The paper contains a table giving values of the stress calculated by this method from drawings of the conical pistons of the United States torpedo boat destroyer Truxton.

In discussing Prof. Shepard's paper M. Nusim stated that Prof. Shepard did not take into account the theory of elasticity, but depended entirely on statical considerations. In arriving at the equation of equilibrium, the couple of the bending moment acting on any meridian section of the piston was not taken into account. Mr. Nusim gave a discussion of the method of specifying the state of stress of a conical piston and concluded that the resulting thrust over the whole section made by a plane through the axis is the product of the fluid pressure and the projected area of the piston cut out by two meridian planes an infinitesmal distance apart, and showed that by neglecting to introduce the couple above discussed, Prof. Shepard's conclusions are in error. The rational solution of stress distribution cannot be obtained by statics alone. but there must be used, in addition, the mathematical theory of elasticity, or the result will be an approximation.

### A Journal Friction Measuring Machine.

Henry Hess gave a description in a paper of a machine in which journals can be subjected either to a radial load, or thrust load, or both simultaneously. It has the capacity of a total radial load of 15,000 pounds, a total thrust load of 10,500 pounds, and a combining radial and thrust load in any desired proportion. The speeds can be varied from 150 to 2,500 revolutions per minute. The machine differs from others in the accuracy with which the friction coefficients of the bearing under test may be determined. The observation errors are inside of 0.5 per cent. The sensitiveness is sufficient to permit an analysis of bearing friction that will show the influence of the slight sliding friction that is always present beside the rolling friction.

In discussing Mr. Hess's paper, J. Royden Pierce cited an example of the slight friction in ball bearings. He told of a marble rubbing table weighing 16 tons and having a moment of inertia of 20,200, which ran 25 minutes after the power was shut off. In this case U = 0.0077, including the friction of two rotary bearings in the stem and two ordinary bearings on a horizontal quill. The speaker stated that he used ball bearings on spindles carrying carborundum wheels running at about 1,500 to 2,000 revolutions per minute, some of the wheels weighing nearly one ton. These bearings lasted six months, operating eight hours per day, and then only required new balls. Improper cages or ball separating devices may cause heating, or ruin the bearing. The small clearances in well designed bearings are so exact that any distortion by heating will either break the balls or ruin the race. A testing machine sensitive enough to detect small changes in the frictional resistance of ball bearings would be of great value to engineers.

Prof. Brashear inquired as to the earliest date of the use of ball bearings. He told of a telescope which he had seen in 1859, which was mounted on 5/8-inch balls. All telescopes now built are mounted this way. Prof. Benjamin stated that the present machines for testing bearings of other types than ball bearings were too complicated and that there was great room for improvement.

This closed the professional proceedings of the afternoon and the secretary then read an invitation from the Semet-Solvay Co. to visit its plant at Delray, which was described in a paper to be presented the next day.

## THURSDAY AFTERNOON SESSION.

A variety of papers were read at the regular Thursday afternoon session of the society.

### The Surge Tank in Water Power Plants.

This paper by R. D. Johnson treats of the momentum of flowing water in long pressure pipes for the supply of hydraulic turbines and of the control of the rate of flow by modifying the momentum in a manner to obviate harmful effects upon speed regulation of the water wheels, without waste of water through relief valves, deflecting nozzles or by-passing, as has usually been thought unavoidable where pipes are long, velocity great and pressures high. This is accomplished by a surge tank near the down stream end of the pressure pipe, atmospheric or under compressed air. The paper treats of the size of surge tank needed under various conditions of velocity, size and length of the moving water column, and presents a novel device called the "Differential Regulator," by which the diameter (or area) of the tank may be reduced about one-half, thereby lessening its cost and at the same time improving the pressure regulation for speed control.

Mr. Harza opened the discussion of this paper, stating that he was able to simplify several of Mr. Johnson's equations. Taking slightly different assumptions from Mr. Johnson, Mr. Harza worked out an equation of his own simple in form, and with it solved Mr. Johnson's typical problem. Mr. Harza's results agreed with Mr. Johnson's when friction in the pressure pipe was not considered; not including friction but including governor action Mr. Harza's results were 20 per cent larger; including both friction and governor action, his results were double those obtained by Mr. Johnson. Mr. Harza also stated that he could see no advantage in the differential feature of Mr. Johnson's apparatus, it being equivalent to placing a resistance between the surge tank and the turbine, which is detrimental to good speed regulation. Mr. Knowles stated that in experiments on the city water pumps at Pittsburg, the observed oscillations in the surge tanks there agree with the calculated results produced by Mr. Johnson's formulae.

Prof. I. B. Church attacked the paper vigorously, stating that a fundamental error was made in the original assumption in that Mr. Johnson used the square of the difference of the two velocities in the pressure pipe, whereas he should have used the difference of their squares. Mr. Johnson in closing claimed that Mr.

Church has not taken all the factors of the problem into consideration.

**Some Pitot Tube Studies.**

Prof. W. B. Gregory and Prof. E. W. Schoder presented a paper on the above subject.

In this paper the distribution of velocities and pressures of flowing water were determined in straight and curved portions of a pipe. A study of the indications of a Pitot tube, both with the impact opening facing the current and reversed, in straight pipe with normal elliptical velocity distribution, gave a means for finding the true velocities and the relative pressures throughout cross sections in a curved portion of the pipe where the flow was distorted. There is given a convenient method of making Pitot tube traverses in straight pipe. The modified indications of static pressure by the static openings of a Pitot tube due to suction actions are explained.

Prof. L. A. Moss in opening the discussion said that much more experimental work would be necessary to confirm the results obtained by the down-stream Pitot tube, adding that the down-stream reading was affected by the size and shape of the tube. George A. Orrok confirmed the curves published in the paper, but said that the down-stream readings were of no value in dealing with the flow of air. Dr. Henry T. Eddy continued the attack on the down-stream readings, declaring that he failed to see any usefulness in them whatsoever. R. D. Johnson concluded the discussion by stating that the down-stream tubes were found useful in calibrating 150 tubes at the plant of the Toronto Power Co. at Niagara Falls, because they had a unit co-efficient which plain piezometer tubes do not have.

**Comparison of Screw Thread Standards.**

In the next paper by Amasa Trowbridge a diagram is submitted to show what is possible or impossible in combining the present recognized standards for screw threads. On this are curves comparing the Pratt and Whitney standard thread for machine screws, the U. S. standard thread and the A. L. A. M. standard with the standard recommended by the machine screw committee of the A. S. M. E. The latter is recommended because of its uniform proportions for sizes below 7/16-inch diameter and the U. S. standard for larger sizes. The standard of the automobile manufacturers is adapted only for the special use intended.

L. D. Burlingame opened the discussion of this paper, stating that experience has shown that finer threads than those prescribed by the U. S. standard are necessary for the smaller diameters, corroborating Mr. Trowbridge's proposal to use the new A. S. M. E. standard below 7/16 inches. Mr. Burlingame derived a simple formula for the number of threads, which coincides with the A. S. M. E. standard up to 5/16-inch, and in the larger sizes takes a mean between the old U. S. standard and the A. L. A. M. standard. A. George Mattsson confirmed Mr. Trowbridge's opinions saying that finer threads were particularly necessary for boiler work. As a result of the discussion a motion was passed to have a committee appointed to present the matter of making a thorough and careful investigation of standard screw threads to the council.

**Identification of Power House Piping by Colors.**

W. H. Bryan states in this paper that the number, extent, and variety of pipe lines in modern plants have become so great as to lead to confusion, resulting in uncertainty, delay and occasional accident. A beginning has been made toward the quick identification of such lines by coloring, further subdivision being secured by giving the flanges a different tint. The value of some such plan in emergencies, and to supervising engineers and inspectors, is evident. The author discusses the situation fully, giving a list of schemes already in use. He recapitulates the requirements of the case, and believes that the time is ripe for concerted action looking to the establishment of a uniform, standard, and widely applicable color scheme for this purpose.

In discussing the paper, G. E. Mitchell suggested a tentative color scheme and pointed out that arrows should be placed on the pipes to indicate the direction in which the fluid within was flowing. He proposed that the darker colors be used in the boiler room, the lighter ones being easily soiled. He also suggested that rising spindle valves be used wherever possible, and in their absence the direction of motion in opening and closing valves should be clearly marked. F. W. Simon said that the color scheme adopted should be national or if possible international in its scope. He pointed out that plants which are provided with painted pipes could obtain lower insurance rates. Upon motion of John W. Lieb, a commmittee was appointed to refer the matter to the council, urgently requesting that steps be taken to establish a standard color scheme by means of which power house piping can be identified.

**GAS POWER SECTION.**

Simultaneous with the regular Wednesday afternoon session, the gas power section convened with President Lucke in the chair. H. H. Suplee, secretary of the section, announced the chairmen of the two standing committees on membership and meetings, as R. T. Lozier and Henry L. Doherty, respectively. He then spoke of the work of the standardization committee, and read the progress report. The committee stated that at present there is no standard method of guaranteeing engines, and it invited suggestions from the members on this point. Letters to the standardization committee were read from J. R. Bibbins, H. F. Smith and A. D. West. These made various recommendations to the standardization committee, taking up the subjects of ratings, capacity, specifications, guarantees, etc. Mr. West in his letter remarked that the effective heat used in computations of gas engine power should be the effective British thermal units producing power. The secretary also read a letter from the National Fire Protection Association, asking information as to the storage and care of gasoline, viewing the matter from a fire protection standpoint. The matter was referred to the membership of the section at large, with a request that any information on this subject be handed to the secretary, who would transmit it to the Fire Protection Association. This closed the regular business and the meeting was then devoted to the reading and discussion of papers.

The first of these was W. H. Blauvelt's paper entitled "The By-Product Coke Oven."

This paper gives a definition of coke and statistics comparing the growth of the total production with that from the by-product oven and compares the coking process in the bee-hive and retort ovens respectively. General descriptions of by-product recovery apparatus, and the method of recovering the several by-products is given and also the operation of the by-product oven. It also discusses the storage and handling of coke and coal; charging and discharging the ovens; power consumed in the various operations of a by-product oven plant; effect on the coking process of different temperatures, and different refractory materials, results from different qualities of coal. It compares bee-

hive and retort oven coke, and shows the industries depending upon the by-products from coke. It also forecasts the future of the by-product oven in the United States.

J. R. Bibbins started the discussion on this paper by saying that the first large coke oven gas plant in the United States was at Lebanon, Pa. Two different types of ovens are installed and the gas is taken from them and used in engines at the works of the American Iron & Steel Co. Mr. Bibbins described the methods used for the removal of sulphur from the gas, iron oxide purifiers being installed. The gas is sold as produced, sometimes there being an excess of the consumer's requirement and sometimes a deficiency.

C. N. Barber in discussing the same paper presented a scheme for the cooling of coke without the use of water. He stated that coke when taken from the oven had all the combustible material which would ignite on exposure to the air removed, and that if distributed so that it was freely exposed to the air, it would cool exactly as a piece of steel cools, and without further combustion. His cooling system comprised a system of conveyors which required about three hours to pass the coke from the ovens to the furnace or storage bin. The coke made by this process was stronger and better than coke quenched with water, due to a number of causes.

C. G. Atwater called attention to the increase in the production of coke during 1907 over that of 1906. The increased production, he showed, was due almost entirely to the increased production of by-product coke. He inquired about the troubles encountered with sulphur in the engines at the Lebanon plant, described by Mr. Bibbins. Mr. Bibbins replied to this that they had found it was only necessary to keep water and the sulphur in the gas away from one another, and that when this was done no ill effects were encountered from admitting sulphur to the engine.

Prof. R. H. Fernald told of experiences with sulphur at the fuel testing plant at St. Louis. They there were using a California lignite at one time running as high as 8.2 per cent in sulphur. No scrubbers or purifiers were installed, and no trouble was encountered when the gas was kept free from moisture.

John C. Parker inquired as to the relative cost of the primary product and the value of by-products in by-product coke ovens. He inquired as to what danger there was of the increased market for by-products pushing the cost of the principal product beyond the economical limit. He also inquired as to how deficiencies in the supply of gas at Lebanon were remedied, and whether it was necessary to install a producer plant or not to take care of these deficiencies. Mr. Rathbun stated that a certain concern had had trouble in lubricating the piston rod, and that this had been overcome by circulating hot water through the rod instead of cold. Mr. Blauvelt in his closure stated that in time he thought that the existence of sulphur in the gas would be neglected. He stated that the sulphur at Lebanon was high, running as much as three grains per cubic foot. He did not think that purifiers would in the near future be considered a necessary part of a producer-plant installation. Replying to Mr. Parker, he stated that the term "by-product" was relative, and largely determined by local conditions; that at one plant gas might be the primary product, and coke, ammonia and tar the by-products, while at some other plant any one of the last three might be the primary product, and the others by-products.

### Power Plant Operation on Producer Gas.

Godfrey M. S. Tait then presented a paper on power plant operation on producer gas, of which the following is an abstract:

Experience with gas producers for engine operation have brought out the following facts: (a) Owing to the high percentage of fusible ash in American fuels, European data as to sizes of producers and general design are generally misleading when applied to American conditions. (b) While low rates of gasification obviate clinker troubles, the incident low temperatures interfere with the complete dissociation of the steam in the draft, and so cause a great range of variation in the amount of hydrogen in the gas, when the load on the plant varies. As the variation in percentage of hydrogen affects the ignition point of the gas it seriously affects the regulation of the engines. (c) A simple and satisfactory remedy for these conditions tried by the writer was the elimination of the moisture in the draft (and consequently the hydrogen in the gas), thus making a gas of an absolute fixed value and having one ignition point under all conditions.

The principal feature brought out in the discussion of this paper was the question of superintendence. H. W. Peck stated that it was his experience that a machinist made a better operator for a gas plant than a man who had formerly been in charge of a steam plant. This opinion was confirmed by F. H. Stillman.

Mr. Jones, a non-member, requested that the section take up the question of engines operating on illuminating gas. He stated that in Chicago he heard regularly from 700 illuminating gas engines, 500 of which ran perfectly, while the remaining 200 were always giving more or less trouble, which the manufacturers were unable to explain. He requested that this matter be investigated by the society, and that recommendations be made to remedy illuminating gas engine troubles.

Two other papers were presented by Lionel S. Marks and W. D. Mount on horsepower friction, losses and deficiencies of gas and oil engines, and a simple method of cleaning gas conduits respectively. There was no discussion on either paper.

### Horsepower, Friction Losses, and Efficiencies of Gas and Oil Engines.

In this paper Mr. Marks says that indicated horsepower and the efficiencies derived from it are of little use in comparing the performances of different gas engines. Indicated work in the four-cycle engine is the difference between the total work done by the gas and the gas friction work of getting the gas into and out of the cylinder. These two components should always be determined separately, and thermodynamic efficiencies should be calculated from the total work. If total horsepower, gas-friction horsepower, machine-friction horsepower, thermo-dynamic efficiency, engine efficiency, mechanical efficiency and net efficiency are determined, they will permit really useful comparisons between engines of different types and between any engine and the ideal.

### A Simple Method of Cleaning Gas Conduits.

Mr. Mount three years ago asked for proposals on a battery of gas producers, including the design of the distributing conduit and branches, the question of an uninterrupted flow of gas of uniform quality being of exceptional importance. The placing of the contract was based largely on the method or system of cleaning, and a design of distributing conduits which seemed to provide the greatest facilities of uninterrupted service. The construction adopted provided openings in the conduit for blowing depositions of soot into the stack, by means of steam jets,

connections to the base of the stack being arranged from each distributing conduit. When the method of cleaning put into effect compressed air was used in place of steam. Cleaning is conducted without interruption to the producers, conduits, and furnaces, and that the method is efficient is evidenced by the fact that when the conduits have to be opened for repairs they have always been found clean to the brick lining.

## FRIDAY MORNING SESSION.

The first paper taken up at the Friday morning session was by F. W. Dean and A. C. Wood, on economy tests of high speed engines. Eight engines were tested, some with single flat valves, one with two flat valves, one with four flat valves and two with piston valves. All were direct-connected to generators. The object of the tests was to determine the steam used per indicated horsepower-hour and per kilowatt-hour, and also the efficiency of the set, as shown by the ratio of the indicated horsepower to the electrical horsepower at the switchboard. The results varied from 29.53 pounds of water per indicated horsepower-hour or 43.42 pounds per kilowatt-hour to 44.02 pounds per horsepower-hour and 79.30 pounds per kilowatt-hour, respectively.

In discussing this paper, G. H. Barrus commented on the cause of leakage in piston and flat valve engines. Owing to differences of construction in the valves some of the engines in the above tests with four valves should not be compared with single flat valve engines, unless it was positively known that the adjustment of distance strips in the valves were the same in both cases. The value of the paper would have been greater had one-ring piston valve engines been included in the tests.

C. A. Dawley said that stress should not be placed on these tests as indicating the type of engines to be built. The conditions in the tests were not changed in such a manner as to show the effect of any one condition on the operation of the engine. He laid great stress on the subject of piston leakage, stating that tests on air compressors showed percentages of piston leakage of 4.39, 7.75, 13.30 and 14.85 under rated load conditions. Small machines showed worse and large ones better economies under similar conditions of operation.

R. H. Rice spoke of the difficulty of running accurate tests in the ordinary station. He said that the question of valve and piston leakage had a most important effect on the efficiency of the engine. The higher efficiencies of compound engines were due to the fact that leakage through the high pressure cylinder were intercepted and utilized in the low pressure one. In the tests given in the paper, the engines showed improper cylinder design for working with the generators to which they were attached. The tests were too few in number to give reliable information, and it was merely accidental that piston valve engines showed better results than other types. It was regrettable that engines with complicated valve mechanism, designed to increase the steam efficiently had shown no better results than other types. The double poppet valve is the only one to use with superheated steam in engines, said the speaker, although the single poppet valve had given good results in steam turbine work. He compared the tests of the paper with those of turbines of the same rated capacity. The turbines are more economical than engines, as there is less internal friction, there being fewer rubbing surfaces. He said that with loads up to 150 kilowatts the non-condensing turbine had better economy than the reciprocating engine.

R. C. Stevens detailed the construction of a valve which adjusts itself automatically and takes up wear, remaining steam-tight without refitting. He cited a valve which had operated for 17 years without repairs. In engine contracts a maintenance guarantee should be called for, as well as one for steam consumption, he said.

J. C. Parker said that the failure to obtain high results in engine performance was often due to niggardly practice in regard to maintenance of small plants by the owners. That all they require is that the engine should run so many revolutions per minute, and as long as it did economy was lost sight of. In office building steam plants the cost of maintenance per unit of utility developed is disproportionately high, and the attempt to reduce it at first sight appears to be niggardly management. Speaking in regard to heating the building, Mr. Parker said that an attempt to raise the apparent heating efficiency by cutting down the grate area of the boilers was bad practice. In regard to power generation by small plants or office buildings these should pool interests and erect a common central plant or purchase power from a public service company.

F. A. Halsey described a compensating double beat poppet valve which eliminated valve leakage.

G. A. Young thought the results of the tests as given by the authors were too high, and compared them with some he had made.

**Air Leakage in Steam Condensers.**

In this paper, Thos. C. McBride advocates measuring, by air pump displacement and temperature, the amount of air passing through a condenser, and comparing this amount in different condensers on the basis of its ratio, by volume, to the steam being condensed. The amount of air passing through condensers, as presupposed by manufacturers' ratings of air pumps, is calculated, and 4½ volumes of air per 10,000 volumes of exhaust steam is established therefrom as the average maximum amount these ratings allow. The paper includes curves showing the theoretical relationship of the volume of air while in the exhaust pipe and after it has reached the air pump suction pipe. Tests are cited showing widely different air leakages, the leakage in one case amounting to about 18 volumes and in another to from 2 to 3 volumes of air per 10,000 volumes of exhaust steam. The paper recommends that in testing condensers engineers measure the amount of air on the basis suggested, and publish their results in order that the amount of air anticipated by ordinary practice may be established.

In discussing this paper, Chas. A. Howard objected to placing the burden of specifying the air leakage on the purchaser. He suggested that the exhaust piping from prime mover to condenser be put in the condenser contract as the greatest leakage occurs in this part of the system. If the purchaser specifies the leakage, the contractor will be relieved from all guarantees, as he will claim that air leaks are in parts of the system for which he is not responsible, as the piping or engine. In steam turbines of the Parsons type the air leakage is negligible; in Curtis turbines at light loads it is considerable, but at full loads, for which condensers are always designed, the air leakage is as low as in the horizontal turbines.

C. L. Heisler contended that the condenser builders should be relieved from guarantees which made them responsible for the work of others, and that the purchaser should specify the air leakage. It was unfair to burden the condenser builder with the expense of correcting other contractors' errors. He cited the effects of even small leaks, showing that an orifice 1/16-inch diameter will reduce the vacuum ½ inch, and one ⅛-inch diameter will reduce it ⅞ inch, with

the barometer at 29.2 inches. Before opening the above orifices a dry air pump 20 x 12 inches was maintaining a vacuum of 28.9 inches. The customer in buying a vacuum pump should ask that the vacuum be kept within 0.3 to 0.4 inch of the barometer, when pumping from an air-tight chamber at its rated speed, and should not specify a certain number of inches. The purchaser should also specify the approximate volume to be displaced.

**Clutches.**

The above was the subject of a paper by Henry Souther. This paper reviews the basic knowledge in regard to clutches which existed prior to the coming of the automobile and its attendant clutches. Prior to that time there was comparatively little interest in the subject, but clutches have since become as much a subject for discussion. Each type of clutch has its partisans, and yet few engineers have persisted in the use of any one type, showing that the clutch is still in process of evolution. The author takes the ground that the simplest form of cone properly mounted is, all things considered, the best. He realizes, however, that this is debatable, and that while this might be true for pleasure cars, it might not hold good for commercial vehicles. It is not at all improbable that some form of electric or magnetic clutch must be developed to meet the demands of commercial usage.

The discussion on this paper ranged mainly along the lines of automobile work, although F. DuP. Thompson presented a description of the Steckel induction drive, which appeared in these columns, June 11, 1908. Readers are referred to that article.

Frank Mossberg described the various types of clutches used on power presses, presenting illustrations of each type.

Written discussions were also presented by C. W. Hunt, C. B. Rice, F. A. Waldron and others, but owing to lack of time were not read. They will be printed in the proceedings of the society in the near future.

Thos. A. Fay, president of the Association of Automobile Manufacturers, addressed the meeting on the subject of automobile clutches.

At the conclusion of his talk, C. W. Hunt presented a set of resolutions thanking all concerned in the magnificent entertainments tendered the society, after adopting which the convention adjourned.

**Social and Excursion Features.**

It is probable that entertainment on so lavish a scale has not been provided for the society in many years. Detroit is a city unusually well equipped for entertaining a convention with its natural attractions and many industries. On Wednesday morning the entire membership and guests, together with the other societies in convention at Detroit, were taken by steamer to the launching of the steamer Daniel B. Meachem, at the Ecorse yards of the Great Lakes Engineering Co. The launch was successful in every respect, the boat being christened by Miss Kennedy, daughter of Julian Kennedy. Invitations were received to visit numerous plants, among them those of the Burroughs Adding Machine Co., the Semet-Solvay Co., and the Packard Automobile Co., which were accepted by many.

Wednesday evening the members of the society, guests and ladies, were entertained by a brilliant lecture on "Contributions of Photography to Our Knowledge of Stellar Evolution," by Prof. John A. Brashear, Allegheny, Pa. The lecture was beautifully illustrated with original astronomical photographs of various constellations and nebulae, both in the northern and southern hemispheres. Prof. Brashear included in his talk an outline of the modern theories of the formation of the universe.

The reception Thursday evening at the Cadillac was the usual enjoyable affair.

On Friday afternoon the steamer Brittania conveyed the party around Belle Isle Park, and through the Detroit river, supper being served at Bois Blanc Island.

The entertainments provided for the ladies were many and varied, and included a trip to and luncheon at Belle Isle Park, luncheon at the Country Club, automobile rides, etc.

# ENGINEERING AND INDUSTRIAL EDUCATION DISCUSSED BY THE SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION

The Society for the Promotion of Engineering Education convened for its sixteenth annual meeting at Detroit, Wednesday afternoon, June 24, being welcomed by Mayor Thompson.

In the absence of President Howe, the chair was occupied by Vice President W. G. Raymond of the University of Iowa.

The reports of the treasurer and secretary were received and showed good financial conditions and large growth during the year, the membership now exceeding 600. The technical papers and discussions of the afternoon were next taken up.

Prof. D. C. Jackson presented the report of the joint committee on engineering education. This committee is unique in being the first official joint gathering of representatives of all the national engineering societies for the investigation of engineering education. Its composition follows:

American Society of Civil Engineers, Desmond Fitzgerald (chairman), B. M. Harrod; American Society of Mechanical Engineers, Fred W. Taylor, A. C. Humphreys; American Institute of Mining Engineers, H. M. Howe, John Hays Hammond; American Institute of Electrical Engineers, Chas. F. Scott, Dr. Samuel Sheldon; American Chemical Society, Clifford Richardson, Henry P. Talbot; Society for the Promotion of Engineering Education, Prof. C. L. Crandall, Prof. J. M. White and Prof. D. C. Jackson.

Two papers dealing with the value of the study of English in engineering schools formed the bulk of the technical discussion at this session.

The first of these papers, "The Course in English in Technical Schools," by Prof. J. Martin Telleen, Case School of Applied Science, went broadly into the general phases of the subject. Prof. Telleen sketched the deficiencies of the average engineering student in English, referring to his contempt for the subject as being "effeminate." He pointed out the qualities the successful teacher of English should possess; discussed the relative value of composition work and critical reading, and concluded with a three-fold summary of the place of English in the technical school:

1, a humanizing, broadly cultural influence; 2, to develop a clear style of composition; 3, to correlate the work of the purely technical departments of the school; 4, to cultivate a love for good literature.

Dr. William Kent's paper, "Results of an Experiment in Teaching Freshman English," showed how the efficiency of the instruction could be measured by comparing similar tests given at the beginning and end of the year. The results of a test of 79 students showed over 20 per cent improvement in one year.

The discussion of these papers was spirited and comprehensive, bringing out clearly that the engineer to be a success must be able to handle both written and spoken English with clearness and force.

"A Proposed Course in General Engineering," by Howard Frost, editor of the *Engineering Digest,* gave a course designed to ground a man in the fundamentals of all branches of engineering. Mr. Frost pointed out the danger of overspecialization and the growing demand for a general course of this character.

"Present Curricula of the Mechanical Engineering Courses," by Prof. W. T. Magruder, presented in concise tabular form a comparative study of the elements of the curricula of all the important schools in the country.

The evening was given to a joint session with the American Society of Mechanical Engineers at Prof. Brashear's lecture on "Contributions of Photography to Our Knowledge of Stellar Evolution."

### THURSDAY SESSION.

The second session of the society was held on Thursday afternoon. President Charles S. Howe delivered the annual address on the subject: "The Function of the Engineer in the Conservation of Natural Resources of the Country." Referring to the recent convocation of governors in Washington on the subject of natural resources, he showed that the engineer had a large share in the using up of these resources, and to him must be entrusted the task of devising means of diminishing wastes and of more perfectly utilizing the gifts of nature.

A. L. Rice read a paper on adapting means to the end in technical education. The author showed that the end in view was the education of an engineer and held that every subordinate study in the course should be directly adapted to that end and should not be taught for its own sake or as a culture study.

Prof. A. L. Wright read a paper on the place of foreign languages in the curriculum of the schools of engineering. He presented a sheet of statistics of 46 engineering schools, and showed that no two of them had the same requirements for entrance or the same number of hours of instruction of foreign languages in the course. Ten colleges out of the 46 gave no instruction in foreign languages at all, and of those that did give instruction, the requirements varied exceedingly in quantity. He showed the advantage of a knowledge of foreign languages to an engineer and pleaded for their retention in the course.

Prof. W. F. M. Goss read a paper on second degrees for graduates of engineering courses. He showed a great difference in the practice of different colleges in regard to giving degrees. Many of them give the professional degrees of M. E., C. E., etc., on graduation, but most of the state universities and many other colleges gave the degree of B. S. on graduation, and followed it with a professional degree given after three years of practice, the presentation of a thesis, and passing of an examination at the college. A resolution was passed referring to a committee the whole question of engineering degrees in the hope of securing more uniformity in the practice.

Prof. John Price Jackson read a paper on scholasticisms in engineering education. He showed how in the development of education during the last 500 years from the monasteries and the old-fashioned colleges of classical learning, advances in the direction of adopting modern ideas and of getting rid of old rubbish progressed very slowly, and many of our colleges are still handicapped by old scholasticisms. He said the time is ripe for an investigation of the curricula of engineering schools to see if many things now taught therein should not be dropped, in order to make time for the necessary more modern studies.

### SATURDAY MORNING SESSION.

The principal discussion at the Saturday morning session hinged around Dr. Schneider's presentation of the co-operative engineering courses at the University of Cincinnati and Prof. Furman's paper on the career of graduates in mechanical engineering and also on the discussion of the subject of the advisability of increasing the length of the engineering course. Many questions were put to Dr. Schneider as to the practical workings of his scheme and as to what could be accomplished by schools at long distances from industrial centers. It was brought out by Dr. Schneider that, where the school was located at a distance from the shops with which it was co-operating, it would be necessary to make the alternate periods of university work and shop work of greater duration, perhaps three months in length. He cited the case of two students who lived in Dayton and attended the University of Cincinnati and worked in shops in Dayton on alternate weeks. As this involved traveling a distance of 60 miles each week, it is evident that distance is no bar to the use of this scheme. It was also brought out by Prof. Kent that Dr. Schneider's course did not aim to do away with the present methods of engineering instruction, but afforded an opportunity to perfect men for other branches of engineering, in addition to those now taught. For instance, the machine tool industry has been more or less neglected in the present scheme of instruction and Dr. Schneider's scheme is to train men fitted to take foremenships and superintendencies in this industry.

Prof. Furman's paper tabulated the careers of the graduates of Stevens Institute of Technology, of which 1,039 are living. The occupations of these men were tabulated and curves were drawn, showing the percentages of the whole number involved in various lines at the end of five-year periods. The curves showed that, by the end of the 15th year, the great majority of the graduates had risen to positions of high responsibility, such as presidents and managers of great corporations, chief engineers and consulting engineers. The number of men in minor detail technical positions at the end of five years decreased to a small percentage, most of the men having attained the position of at least assistant superintendent in their respective lines. At the end of 15 years, of those who were not holding executive positions, the great majority were in consulting and contracting engineering, being independent of corporations. The paper forms a splendid supplement of J. M. Dodge's presidential address before the mechanical engineers some years ago and is a tribute to the immense value of engineering training.

In the discussion on the proposal to increase the length of the engineering course to six years a curious division of opinion appeared. The advocates of the six-year course seemed to be entirely composed of the professors who had been teaching a

great number of years. The opponents of the proposal were the practical engineers, or the teachers who had been teaching but a short time. The professors seemed to base their ideas on the difficulty of teaching engineering properly in four years, and viewed the problem more from the standpoint of the teacher than from that of the engineer or student. The engineers seemed to be of the opinion that four years were ample time to spend in school, considering the advanced age at which students entered the engineering college and the fact that most of them took a two years' course in the machine shop, either before or after their college course. Inasmuch as most manufacturers insist on the new graduate coming in contact with grease and overalls immediately after graduation, increasing the length of the course to six years would make the start of the student at actual engineering work very late in life.

**Victory for Jones & Laughlin.**—The supreme court of the state of Pennsylvania has reversed the decision of the lower court in the case of Sullivan against the Jones & Laughlin Steel Co., which held the officials of the company in contempt for failure to abate the ore dust nuisance at its Soho furnace plant, Second avenue, Pittsburg. The Sullivans, nearby residents, had complained to the lower court that the steel company had not remedied the trouble as it had been directed by the court, in the original action brought by the property holders. Accordingly, upon a hearing, fines for contempt were assessed by the court against B. F. Jones Jr., president, and other officials of the company. The supreme court, in reversing the finding of the local court, held that the steel company was doing all in its power to abate the nuisance, and that it had materially lessened the annoyance arising from the furnace dust, and released the officials from any charge of contempt. President B. F. Jones Jr., following the decision, stated that, while the company was much gratified at the outcome, it would still continue to do everything possible to improve the conditions about its furnace plants, for the benefit of the nearby residents.

The plant of the Herron Pump & Foundry Co., Chattanooga, Tenn., which has been idle and in the bankruptcy court for some time, was bought in for the creditors June 20, the price being $12,000.

## ALGOMA MILLS REOPEN

**And Dominion Co.'s Plant Runs at Capacity to Supply Rails to Northwest.**

Toronto, Canada, June 23.—As is officially announced, the Bessemer, open-hearth, blooming and rail plants of the Algoma Steel Works at Sault Ste. Marie, Ont., which closed down about two months ago, reopened Monday, June 22, with a full force of men. The blast furnace will not be started immediately as there is a large accumulation of pig iron on hand.

The blast furnaces and steel plant of the Nova Scotia Steel & Coal Co., Sydney Mines, N. S., closed down on June 15, the reason given being that the company had a large supply of steel on hand. The finishing plant at Trenton is still in operation. The closing of the works gives the company an additional supply of 600 tons of coal per day to dispose of. The output of coal is rapidly increasing, shipments for the first five months of the year amounting to 223,495 tons, as against 163,627 for the corresponding period of 1907. The new coal mine, Sydney No. 4, began production on an appreciable scale this month, and is expected to yield about 400 tons per day.

The Dominion Iron & Steel Co. of Sydney, N. S., is running to full capacity day and night with every available skilled workman employed and will ship rails by three steamers for upper lake points for the Canadian Pacific, Canadian Northern and Grand Trunk Pacific roads now under construction in Western Canada. Its output for 1908 is expected to double that of any previous year. The company has purchased half of the property known as Carlin's farm, near its blast furnaces, in order to be in a position to increase its furnace equipment.

The interest of the late Charles Gurney, of Hamilton, Ont., in the Gurney-Tilden foundry, of that city, has been acquired by John Tilden, his former partner, for $135,700. Mr. Tilden will organize a new company to carry on the business.

James L. Sharkey, A. Monac-Lesser, George A. Martin and others have obtained a charter as the Hamilton Tube Co., Ltd., with $50,000 to manufacture tubing, and will shortly begin operations at Hamilton, Ont.

A charter of incorporation has been obtained by the Anchor Screw Co., Ltd., Toronto, with an authorized capital of $200,000, the provisional directors being Wm. Johnston, Robert Worth, Alex. Johnston and Geo. A. Gauthier.

Walter Coulthard, a prominent citizen of Oshawa, Ont., died June 16, aged 86 years. Mr. Coulthard came to Canada from Scotland when quite young and engaged in manufacturing in Oshawa in 1875. He afterwards founded the Coulthard & Scott Co., Ltd., which for many years had a successful career as manufacturers of agricultural implements. About six years ago the firm sold out to the Frost & Wood Co. of Smith's Falls.

## BOILER BUILDERS FORM

**Organization in San Francisco as Adjunct to California Metal Trades.**

(Special Correspondence.)

San Francisco, June 23.—Owners of boiler shops in San Francisco met recently in the rooms of the California Metal Trades Association and organized the Master Boiler Makers' Branch as an adjunct to the association, holding the same relation to the parent association as do the iron and steel founders, owners of machine shops, structural steel and ornamental iron shops. The leading shops in San Francisco were represented at the meeting. Most of them were members of the Metal Trades Association and the others applied for membership. A chairman and committee were appointed to draft by-laws and a constitution and to define the objects of the organization.

Work has been started on the new dry dock for the Union Iron Works Co. of this city, at a cost of $600,000. That, with other improvements and additions included in the original plans for that plant, will require an outlay of over $1,000,000.

**Put in Blast.**—Standish furnace, owned by the Delaware & Hudson Co. and leased by Pilling & Crane, has been put in blast after a considerable period of inactivity for repairs and improvements. This furnace is located in Clinton county, New York. It operates on Lyon Mountain concentrates, for the treatment of the finer particles of which a complete clinkering plant has been installed. Additional storage bins have been built, as the finer and coarser grades of ore are shipped separately from the concentrating works at the mines. An Aero pulverizer is used in connection with the clinkering plant.

The Magee Furnace Co., 863 Lake street, Chicago, a Massachusetts corporation, has been incorporated to deal in furnaces, stoves and ranges in Illinois, with a capital of $400,000.

## SMALLER EARNINGS,

### Yet Not So Small as Anticipated, Shown by American Car & Foundry Co.

The annual report of the American Car & Foundry Co. was made at the stockholders' meeting in Jersey City, June 24. In spite of the business depression last year, the falling off in total earnings was comparatively small, running less than $500,000. The income and expense account for the 12 months ending April 30, 1908, compared with the preceding year, is as follows:

| | 1908. | 1907. |
|---|---|---|
| Earnings | $10,624,574 | $11,115,088 |
| Rentals, repairs, other charges | *2,409,956 | 1,768,004 |
| Balance | $ 8,214,618 | $ 9,347,084 |
| Pfd. dividend | 2,100,000 | 2,100,000 |
| Balance | $ 6,114,618 | $ 7,247,084 |
| Com. dividends | 1,050,000 | 600,000 |
| Surplus | $ 5,064,618 | $ 6,647,084 |
| Charged off for new construction | 1,650,000 | 557,548 |
| Insurance res've | ..... | 650,000 |
| Reserved for common dividends | 600,000 | ..... |
| Totals | $ 2,250,000 | $ 1,207,548 |
| Year's surplus | 2,814,618 | 5,349,536 |
| Previous surplus | 19,552,630 | 14,113,094 |
| Total surplus | $22,367,248 | $19,552,630 |

*Includes total deductions of $746,762.

President Frederick H. Eaton in his report points out that notwithstanding the heavy falling off in the demand on the part of railroads for new equipment since the first of the year, yet the production of the company's plants was 51,532 steel freight cars, 32,063 wooden freight cars, 171 steel passenger cars, 574 wooden passenger cars 881,423 car wheels, 16,746 tons of cast iron water pipe, 69,698 tons of gray iron castings, 18,251 tons of pig iron, 136,853 tons of bar iron and axles, and 4,500,000 feet of lumber. The gross sales for the year were $104,319,560. The amount of freight paid to railroads on material received and shipped by the company was $6,625,000. The average number of men employed was 23,521, and the wages paid during the year were $15,915,828.

President Eaton further said:

Conditions recently obtaining in the industrial world have served to emphasize the soundness of the policy to which your company has committed itself; that is, the accumulation of a working capital sufficiently large to enable it to conduct its ordinary operations without strain during times of financial stringency, and to have readily available in prosperous times the capital necessary to produce satisfactory returns. This policy, which has worked so well in the past, should be adhered to. The extent, however, to which our present working capital could be increased, it is difficult now to state—this because of the continually increasing demand for steel construction in both freight and passenger cars, requiring the carrying of largely increased inventories.

During the heavy months of the past year the inventories aggregated $21,000,000, and with the accounts receivable necessitated the borrowing of a larger amount of money than is altogether desirable.

The number of car orders on hand at the close of the fiscal year was the smallest in the history of the company. This was due solely to the general business depression and condition of financial unrest, the first effects of which are always shown in the railroads' retrenchment in the purchase of new equipment and rolling stock. While the company, in common with all other industrial organizations, has suffered from the conditions referred to, the facilities it possesses for the large production of a varied line of materials and supplies of a miscellaneous character for both domestic and foreign trade have served to keep a number of shops at the different plants in a condition of productive activity. The report states that the efficiency of the plants has been fully maintained.

The general balance sheet, as of April 30, showed total assets of $92,843,393, or $11,342,102 less than on April 30, 1907.

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**Will Consider Scale.**—A sub-committee of the Western Bar Iron Association, composed of S. J. Llewellyn, Interstate Iron & Steel Co., Chicago; W. M. Myers, Highlands Iron & Steel Co., Terre Haute, Ind.; and J. E. Kreps, Union Rolling Mill Co., Cleveland, O., will meet with a sub-committee of the Amalgamated Association, in Detroit, July 7, for the purpose of arranging a scale for the ensuing year and settling other matters upon which an agreement could not be reached at the last meeting of the two bodies held at Cambridge Springs, Pa., some time ago. The sub-committe of the Amalgamated Association will be composed of P. J. McArdle, Elias Jenkins and Richard Fitzgerald. The appointment of sub-committees by these two associations to discuss and report agreements is a departure from the policy heretofore in vogue, and was determined upon by both sides in order to facilitate discussion and settlement.

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The annual meeting of the Tower Hill-Connellsville Coke Co., held at Uniontown, Pa., resulted in the re-election of the old officers: President, George D. Howell; first vice president, F. M. Osborne, Cleveland; second vice president, J. B. Thompson; treasurer, J. R. Nutt, Cleveland; secretary and general manager, L. W. Fogg. The company expects to have 300 ovens in operation by Sept. 1.

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The first steel casting ever poured in Clinton county, Indiana, was recently produced at the Frankfort, Ind., brass foundry of the Clover Leaf shops a few days ago. It was produced through a new oil furnace designed and constructed under the direction of Foreman D. T. Hughes.

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The American Steel Frame & Band Iron Co., New York City, has increased its capital stock from $20,000 to $25,000.

## ANNUAL REPORT OF UNITED STATES CAST IRON PIPE & FOUNDRY CO.

The United States Cast Iron Pipe & Foundry Co., in its annual report for the year ending May 31, shows a deficit instead of a surplus, together with shrinkages in gross as well as net earnings. The figures compare with those of the previous year thus:

| | 1908. | Decrease. |
|---|---|---|
| Gross mfg. income | $637,618 | $1,340,872 |
| Other incomes | 136,657 | * 3,096 |
| Total income | $774,275 | $1,337,776 |
| Interest on bonds | 90,000 | ..... |
| Res. for improvements | ..... | 197,000 |
| Res. doubtful accounts | 12,000 | ..... |
| Total deduction | $102 000 | $ 197,000 |
| Balance | 672,275 | 1,140,776 |
| Div. preferred stock | 875,000 | ..... |
| Deficit | 202,725 | *1,140,776 |
| Common dividends | 250,000 | 250,000 |
| Deficit | 452,725 | * 890,776 |
| Previous surplus | 631,801 | * 125,593 |
| Total surplus | 179,076 | 765,183 |
| Res. for depreciation | 163,051 | * 13,051 |
| Res. add working capital | ..... | 162,458 |
| Total ex. res | 163,051 | 149,407 |
| Final surplus | 16,025 | 615,776 |

*Increase

In his report to the shareholders, George B. Hayes, the president, said that business has improved since spring, and suggested that a portion of the extra reserve created for additional working capital, and from extraordinary net earnings, in the past, should be used for dividends until the present depression in cast iron pipe has disappeared. He therefore proposed the beginning of a legal action to determine whether the application of this reserve for dividend purposes should not be permitted by the courts.

"If a favorable decree is entered," added Mr. Hayes, "the preferred stockholders may expect to receive their usual quarterly dividends on their holdings."

Unless such action is taken it is thought unlikely that any dividends will be paid.

E. R. Thomas and C. E. Burke withdrew from the company's directorate and they were succeeded by N. F. Brady, vice president of the New York Edison Co., and John Arthur Hayes, resident manager of the company's plant in Burlington.

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**An Engineering Course.**—In accordance with its general plan of expansion, Marquette University, Milwaukee, will add a course in engineering which will be opened next September. The department will be under the charge of Prof. John C. Davis, formerly of Cornell University, and will include courses in electrical, civil and mechanical engineering. Six or seven instructors will assist Prof. Davis and the course will cover a period of two years' training.

# Dull Market With Lower Prices

Although little improvement in point of activity was apparent in the market in the past week, yet it has been more active than for the preceding fortnight. Opening Monday with several railroad issues showing weakness, the market closed one to four points lower. Irregularity marked Tuesday's transactions, and price changes were unimportant, which was also characteristic of Wednesday's transactions. Thursday the market was extremely dull, and Friday, while stocks were dull, they were firmer in tone and closed higher. The principal stock exchanges and boards of trade in the country closed at 1 p. m., Friday, as a mark of respect to the memory of Grover Cleveland. Saturday the markets were dull and closed fractionally lower. The political situation was a leading market topic of discussion, the best opinion being that trading would continue narrow in the absence of a buying public, at least until after the Denver convention next week. Two factors contributed favorably, one the maintainance of the American Locomotive common dividend, and the other the unexpectedly good annual report of the American Car & Foundry Co. In the showing of the annual report of Cast Iron Pipe & Foundry Co., the common stock fell 6⅜ and the preferred 9¼ points. Favorable reports of Westinghouse Electric reorganization plans advanced its stocks 5⅜ points on sales aggregating 23,400 shares.

Money market conditions continued satisfactory, and the approach of the July 1 payments has failed to exert any notable influence on the New York loan market. Call money is, as it has been, plentiful, and the rate for bankers' balance again touched 1 per cent. The ⅛-cent price reductions in all grades of copper kept the copper stock market inactive.

Business failures for the week ending June 25 numbered 258, compared with 254 last week, and 150 in the corresponding week of 1907.

The weekly statement of the New York banks showed a reserve surplus of $70,858,725, which is the largest surplus for any corresponding week since 1894. In that year the banks reported the largest surplus in their history. The total cash reserve held by the banks exceeds $396,000,000, which breaks all previous records. The actual loans of clearing house banks showed a decrease of $19,747,700; deposits increased $14,347,700, and the percentage of actual reserve 30.63, an increase of 0.59 per cent. The statement of state banks and trust companies showed loans increased $8,726,500, and deposits increased $13,847,700; the percentage of reserve, 32.7 per cent, a decrease of 0.1 per cent. A vote has been taken on the markets to close Friday, as well as Saturday, July 4, Independence day. The number of shares sold during the week was 1,593,365, compared with 1,696,422 last week, and 2,656,400, the corresponding week last year. Bonds, exclusive of government bonds, were sold to the total of $8,628,000, compared with $15,407,000 last week and $4,635,000 the corresponding week yast year.

**New York.**—Amalgamated Copper closed 65¾, a net loss of 1⅜.

**Boston.**—Butte Coalition closed 22, a net loss of 1; Calumet & Arizona closed 108, no change; Calumet & Hecla closed 660, a net loss of 8; Quincy Mining closed 84½, no change; North Butte Mining closed 66¼, a net loss of ¾.

### Financial Notes.

The American Locomotive Co. has declared the regular quarterly dividends of 1¼ per cent on the common stock, payable Aug. 26, and 1¾ per cent on the preferred, payable July 21; the Nicholson File Co., of Providence, R. I., quarterly dividend of 2 per cent, payable June 30; the Pennsylvania Co., controlled by the Pennsylvania Railroad, reduced its semi-annual dividend from 4 to 3 per cent; the American Ship Building Co., the regular quarterly dividend of 1¾ per cent on the preferred stock, payable July 15.

## THE LEADING INDUSTRIAL SECURITIES.

| | Closing Quo. June 27 | Changes in Week | Date 1908 Ann. M't'g | Stock Outstanding | Dividend Basis | Dividend Last Declared | Dividend Date Last Div. Pay. |
|---|---|---|---|---|---|---|---|
| Allis-Chalmers | 10⅛ | − ⅜ | Sept. 3 | 19,820 000 | | | |
| Allis-Chalmers pr | 34⅛ | +1⅛ | | 16.150,000 | 7 cum | 1¾ Q. | Feb., 1904 |
| American Can | 4⅜ | ..... | Feb. 8 | 41.233.300 | | | |
| Am. Can pr | 53½ | −2⅛ | | 41,233,300 | 7 cum | 1¾ Q. | July, 1908 |
| Am. Car & Foundry | 33⅜ | − ⅝ | June 25 | 30,000,000 | | ½ Q. | July, 1908 |
| Am. Car & Fdy. pr | 97⅝ | +1⅜ | | 30.000,000 | 7 n. c. | 1¾ Q. | July, 1908 |
| American Loc | 47⅛ | +4 | Oct. 20 | 25,000,000 | 5 | 1¼ Q. | May, 1908 |
| American Loc. pr | 101¾ | + ¾ | | 25,000,000 | 7 cum | 1¾ Q. | April, 1908 |
| American Ship | 42¾ | + ¾ | Oct. 14 | 7 60 ,000 | 4 | 1 Q. | June, 1908 |
| American Ship pr | 100⅜ | ..... | | 7,900,000 | 7 n. c. | 1¾ Q. | April, 1908 |
| Am. Steel Foundries | 7 | ..... | Oct. 6 | 15 810 000 | | | |
| Am. Steel Foundries pr | 34½ | −3¾ | | 17,240.000 | 6 cum | 2½ | Aug., 1904 |
| Barney & Smith | 50 | ..... | June 2 | 2.000,000 | 4 | 1 Q. | Sept., 1907 |
| Barney & Smith pr | 105 | +5 | | 2,500 000 | 8 cum | 2 Q. | June, 1908 |
| Bethlehem Steel | 15⅜ | +2½ | April 7 | 14,862,000 | | | |
| Bethlehem Steel pr | 44 | + ¼ | | 14 908.000 | 7 n. c. | ¾ Q. | Feb., 1907 |
| Cambria Steel | 31⅛ | + ⅛ | March 17 | 45,000.000* | 6 | 1½ S. A. | Feb., 1908 |
| Cambria Iron | 45 | +1 | | 8,468,000* | 4 | 2 S. A. | April, 1908 |
| Chicago Pneumatic Tool | 25¾ | .... | Feb. 17 | 6,145,800 | 4 | 1 Q. | Oct., 1907 |
| Colorado Fuel | 27¼ | +1 | Oct. 19 | 34 235 500 | | 3½ | April, 1902 |
| Crucible Steel | 57⅞ | ..... | Oct. 21 | 24.578 400 | | | |
| Crucible Steel pr | 41 | −1⅛ | | 24,436.500 | 7 cum | 1 Q. | Dec., 1907 |
| Empire Steel | 8 | ..... | Feb. 26 | 1,254,770 | | | |
| Empire Steel pr | 45 | −3 | | 2 500,000 | 6 cum | 3 S. A. | July, 1907 |
| Fay & Egan | 100 | ..... | Feb. 18 | 1,000,000 | 6 | 1¾ Q. | May, 1908 |
| Fay & Egan pr | 110 | ..... | | 1,000 000 | 7 cum | 1¾ Q. | May, 1908 |
| General Electric | 134 | + ⅛ | May 12 | 65,167,400 | 8 | 2 Q. | July, 1908 |
| Harbison-Walker | 13 | ..... | Jan. 20 | 18,000.000 | | ½ | Oct. 1907 |
| Harbison-Walker pr | 69 | +1 | | 9.6 0,000 | 6 cum | 1½ Q. | April, 1908 |
| International Pump | 22¼ | − ¾ | June 2 | 17.787.300 | | 1 | April, 1905 |
| International Pump pr | 76 | ..... | | 13,835,000 | 6 cum | 1½ Q. | May, 1908 |
| Lackawanna Steel | 34 | .... | March 11 | 34,971 400 | | | |
| Lake Sup. Corp | 5¾ | + ⅛ | Oct. 7 | 40,000,000 | | | |
| New York Air Brake | 66⅛ | +1½ | June 18 | 8.012,500 | 8 | 2 Q. | Oct., 1907 |
| Niles-Bement-Pond | 100 | ..... | Feb. 5 | 8,500 000 | 6 | 1½ Q. | June, 1908 |
| Niles-Bement-Pond pr | 100 | ..... | | 2.000,000 | 6 cum | 1½ Q. | May, 1908 |
| Otis Elevator Co | 35 | +1 | March 16 | 6 156,600 | | 1½ S. A. | April, 1908 |
| Otis Elevator Co. pr | 88 | ..... | | 5.449,500 | 6 n. c. | 1½ Q. | July, 1908 |
| Penn. Steel | 60 | ..... | May 11 | 10,710.000 | | | |
| Penn. Steel pr | 96 | ..... | | 16,5 0 400 | 7 n. c. | 3½ S. A. | May, 1908 |
| Pittsburg Coal Co | 11½ | − ⅛ | Feb. 10 | 28,853.400 | | | Nov., 1906 |
| Pittsburg Coal Co. pr | 42¾ | ..... | | 27,080,800 | 7 c. | 1¾ | April, 1905 |
| Pressed Steel Car | 27½ | +¾ | Feb. 19 | 12,500,000 | | 3 | Aug., 1904 |
| Pressed Steel Car pr | 84 | +1 | | 12.500,000 | 7 n. c. | 1¾ Q. | May, 1908 |
| Pullman | 168 | − ½ | Nov. 11 | 100 000.000 | 8 | 2 Q. | May, 1908 |
| Railway Stl. Spring | 37 | ..... | March 5 | 13,500,000 | 4 | 2 S. A. | April, 1908 |
| Railway Stl. Spring pr | 95 | ..... | | 13,500,000 | 7 cum | 1¾ Q. | June, 1908 |
| Rep. Iron & Steel | 17 | ..... | Oct. 21 | 27,191.000 | | | |
| Rep. Iron & Steel pr | 64 | + ⅛ | | 20,416 900 | 7 cum | 1¾ Q. | April, 1908 |
| Sloss-Sheffield | 50¼ | +1¼ | March 11 | 10,000,000 | 5 | 1 Q. | June, 1908 |
| Sloss-Sheffield pr | 95½ | − ¼ | | 6,700.0 0 | 7 n. c. | 1¾ Q. | July, 1908 |
| U. S. Pipe & Fdy | 20⅜ | −6⅜ | June 24 | 12,500,000 | 4 | 1 Q. | Dec., 1907 |
| U. S. Pipe & Fdy pr | 64⅛ | −9⅛ | | 12 500,000 | 7 n. c | 1¾ Q. | June, 1908 |
| U. S. Steel | 37¼ | + ⅛ | April 20 | 508,302,500 | 2 n. c. | ½ Q. | June, 1908 |
| U. S. Steel pr | 102⅝ | +1¼ | | 360,281,100 | 7 cum | 1¾ Q. | June, 1908 |
| U. S. Steel 5' | 96½ | + ⅛ | | 463,798,000 | 5 | 5 A. | ..... |
| Va. Iron. Coal & Coke | 48 | −4¼ | Nov. 17 | 9.073 680 | | | |
| WestinghouseElec | 55⅝ | +5⅝ | June 24 | 23 933.200* | 10 | 2½ Q. | Oct , 1907 |
| WestinghouseAir Brake | 99 | +3 | Oct. 6 | 11.000,000* | | 2½ Q. | July, 1908 |

Par value of shares, $100, except those starred (*), $50

# NEWS FROM MANY INDUSTRIES

**New Buyers:—**

A. A. Pitt, R. I. Phillips and John A. Brown have incorporated the Pitt Engineering Co., 79 Clark street, Chicago, to manufacture machinery, with a capital of $5,000.

A charter has been granted to the Texas Iron Works, Beaumont, Tex., with a capital stock of $75,000. The incorporators are M. W. Carroll, W. C. Gray, G. W. Carroll, A. L. Harris and C. M. Ives.

Articles of incorporation have been filed by the Reserve Machinery Co., Cleveland, capitalized at $1,000. Those interested are M. R. Holding, M. K. Bosworth, H. H. Holding and W. H. Bosworth.

Articles of incorporation have been filed by the Standard Brass & Iron Works, Milwaukee, through O. L. Hower, R. G. Nashold and Paul D. Durant. The capital stock is placed at $25,000.

The C. Shadegg Engine Co., Minneapolis, Minn., has filed articles of incorporation. Those interested include J. C. Shadegg, H. Knorr, L. B. Fish, J. O. Brown and W. A. Donaldson. The capital stock is $25,000.

The Brozier Blower & Mfg. Co., Elkins, W. Va., to manufacture sheet metal work, with a capital stock of $10,000, has been incorporated by John W. Brozier, Samuel Spears, John F. Mydegger, W. K. Harper and W. H. Cobb, all of Elkins.

Charles B. Price, Harry B. Cown and W. A. Powlank are among the incorporators of the Falcon Engineering Co., 100 Washington street, Chicago, which was organized to manufacture machinery and vehicles, with a capital of $25,000.

The Schuett Mfg. Co., 1101 Unity building, Chicago, has been incorporated for the purpose of manufacturing machinery. The capital stock is $25,000, and the incorporators are: Henry Schuett, Charles P. Schmerker and George Windnagel.

Hurd & Haggin, New York City, to manufacture engines, dynamos, motors, etc., has been incorporated by: Benjamin Hurd and Robert A. Shailer, Nutley, N. J., and Arthur Seal, 250 West 154th street, New York City. The company has a capital of $80,000.

W. W. Oliver Mfg. Co., Buffalo, N. Y., capitalized at $100,000, has these incorporators: William W. Oliver, Frank G. Oliver, Grace E. Oliver, 813 Richmon avenue, Buffalo. The company was organized to manufacture tools, machinery, mechanical implements, etc.

The H. G. Trout Co. of Buffalo, N. Y., has been incorporated to take over the business of the King Iron Works and of H. G. Trout with a capital of $60,000 and with these directors: H. G., W. B. and Lillian G. Trout, H. G. Walker and W. Mummery, all of Buffalo.

A charter has been granted to the Autogenous Welding Co., Springfield, Mass., welding and cutting metals, with a capital of $15,000. The officers of the company are: President, Henry Cave, Elizabeth, N. J.; treasurer, Lawrence C. Fay; and clerk, Fred M. Fay, both of Chicopee, Mass.

The Oriskany Ore & Iron Corporation, Covington, Va., has been chartered to engage in a mining business. Capital stock from $50,000 to $100,000. The officers of the company are: President, R. L. Parrish; vice president; W. W. Taylor, Clifton Forge, Va.; B. T. McPeak, Covington, Va.

The Commercial Engineering Co., New York, has been granted a charter to manufacture motors, machinery, engines, etc., through the following incorporators: Francis C. Green and William H. Fulton, 2 Rector street, and E. K. Post, 120 Broadway, all of New York City. The capital stock of the new company is $150,000.

With a capital of $250,000, the Albertson Power Transmitter Co., New York, to manufacture machinery, mechanical devices, etc., has been incorporated by: William H. Buckout, 321 Tremont avenue, the Bronx; Charles E. Mallison, 615 West 144th street, and Robert Oppenheim, 82 West 127th street, both of New York.

The Imbler Fence & Mfg. Co., Alexandria, Ind., has been incorporated with $50,000 capital. The directors mentioned in the charter are: William E. Carter, John S. Shannon, John C. F. Brattain, J. H. Spenceley, John L. Crider, A. E. Otto, and Virgil S. Day, all of Alexandria, and John Imbler, Carmel, and Lorin L. Hankley, Atlanta.

The Elmore Tool Mfg. Co., Hartford, Conn., has been granted a certificate of incorporation, the capital stock of the company being $100,000. The incorporators are: Charles C. Merridith, Clarence I. Hills and William S. Conning, all of Hartford, Conn. The company will engage in the manufacture of machines, tools, dies, etc.

The Globe Ornamental Iron Works Co., Newark, N. J., has been chartered to manufacture architectural and special iron and metal work with a capital of $10,000. The incorporators are Harvey S. Tonks and William H. Tonks, 504 North Grove street, East Orange, and Edward A. Kohn, 135 Hillside avenue, Newark, N. J.

Relph C. Lupton, George C. Maris and George B. Lewis, Wilmington, Del., have incorporated the Blanchard Machine Co., with a capital of $1,000,000.

With a capital of $10,000, the American Pulverizer Co., St. Louis, Mo., has been incorporated to manufacture and deal in crushing machines, etc. Those interested are: George O. Videtto, J. Porter Henry and R. P. Prewitt.

The Grant-Hoover Rail Co., Camden, N. J., to manufacture ball and roller bearings for axles of trucks, railroad cars, wagons, carriages, etc., with $200,000 capital stock, has been incorporated by R. H. Grant, L. J. Hoover and V. E. Frank, all of Camden.

The Oklahoma Wire Fence Co., Oklahoma City, Okla., has filed articles of incorporation, with $300,000 capital stock. The directors of the new company are: N. V. Elliott and J. W. Shawer, of Bellefontaine, O., and H. G. Chamberlain, of Oklahoma City.

The Portsmouth Vending Co., New York City, has filed articles of incorporation to manufacture mechanical instruments, machines, etc., with $25,000 capital stock. The incorporators are: David J. Burtis, 95 William street; Robert McLeon, 120 Liberty; Chauncey L. Mitchell, 140 Broadway; all of New York, and others.

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**New Construction:—**

The Fowler-Wolfe Mfg. Co., Norristown, Pa., has awarded the contract for an addition to its machine shop, to cost $8,000.

The Janesville Machine Co., Janesville, Wis., has purchased property and will erect a modern office building of brick.

The Runge Machine Co., Richmond, Ind., has planned to rebuild a portion of the Schneider carriage works, and operate a machine shop in the building.

The Burroughs Adding Machine Co. broke ground last week at Detroit for the new office building addi-

tion of reinforced concrete construction.

The Garland Nut & Rivet Co., New Castle, Pa., is steadily working on the construction of the new addition to its plant to be used for galvanizing and wire drawing.

The Standard Steel Co., a subsidiary concern of the Baldwin Locomotive Works, at Philadelphia, has planned to install new power equipment capable of developing 10,000 kilowatts.

The Walker Supply & Machine Co., Markham, Tex., recently incorporated with $10,000 capital to conduct a general machine shop and pipe fitting business, has purchased land and secured plans for a building.

George W. Fifield has taken out a permit to rebuild his machine shop at Lowell, Mass., recently destroyed by fire. The new buildings will be 60 x 130 feet and 100 x 120 feet, at an estimated cost of $20,000.

The New York Metal Ceiling Co., at a cost of $15,000, is remodeling the three-story manufacturing buildings, 534 to 541 West Twenty-fourth street, New York city, adding two stories to each and making them over into one building.

The Hamilton Mfg. Co., Columbus, O., manufacturer of pit car loaders and coal and coke storage machines, has purchased a tract of land on the Big Four railroad, in Columbus, and has plans to erect a new plant of larger capacity.

The Moline Malleable Iron Co. is making several important changes at its plant at Fox, Ill. The furnaces are being remodeled to supply heat for the engine boilers, the old boilers being removed and a new tubular boiler installed in place.

The Moran Bros. Co., Seattle, Wash., is planning for the manufacture of structural steel at its present plant and contemplates the installation of modern machinery. About $200,000 will be expended in improvements within the next few months.

W. H. Kuhns, president of the Ohio Mfg. Co., Upper Sandusky, O., will fit up the second story of a building used as a garage at Columbus, O., for a machine shop, part of the machinery having been installed. The shop will be used for fine work, and also for experimental operations.

The Deemer Steel Co., of which Seldon S. Deemer, formerly general superintendent of the Brylgon Steel Casting Co., is principal stockholder, has prepared plans to install a plant at New Castle, Del. The building will be 107 x 360 feet, and $150,000 will be spent in equipping the plant.

The Automatic Resisting Nut Lock Co., Scranton, Pa., has about completed the erection of its new plant, and will shortly be turning out its product. The machinery was especially made by the Bliss company, of New York, the lock nut itself being an invention of Matthew Malia, who installed the plant.

Work on the new buildings of the Buckeye Steel Castings Co., Columbus, O., is progressing at such a rate that all of the additions will be in shape to start some time during the fall. It was said that upon the return of President S. P. Bush to Columbus, steps would be taken to add another furnace to the one now in operation.

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**General Industrial:—**

A. W. Severance has sold the machine shop and foundry at Walla Walla, Wash., to C. J. Broughton.

The members of the New England Foundrymen's Association, on their recent annual outing, were entertained by the manufacturers of Taunton, Mass.

The Edge Moor Iron Co., Wilmington, Del., is installing a 500-horsepower water tube boiler at the power plant of the Washburn-Crosby Co., Buffalo.

The Dayton Street Railway Co. recently awarded the contract for 20 new cars to the Barney & Smith Car Co., the cars to be finished by the middle of October.

The Pittsburg Steel Construction Co., Pittsburg, writes that the recent increase in its capital stock is to care for an increase in business only. No extension to the plant is contemplated.

L. W. Monnett, referee in bankruptcy, has allowed the bank claims of $7,000 in the case of the Bucyrus Iron Works, Bucyrus, O. Labor claims, amounting to $2,000, were not paid in full.

For the first time in several months, the night shift was ordered at work on the 12-inch mill at the Sylvan plant, Moline, Ill., of the Republic Iron & Steel Co., the last half of the month of June.

Because of the theft of a number of valuable patterns, the plant of the J. W. Hance Foundry Co., Westerville, O., was closed down the middle of the month. As soon as additional patterns could be secured, work was resumed.

The American Bridge Co. has been awarded a contract for the construction of four new open-hearth furnaces for the steel plant of the Tennessee Coal, Iron & Railroad Co., at Ensley, Ala., the work to be completed in 10 months.

The Macksburg Tool Supply Co., Macksburg, O., G. W. Archer general manager, advises that it was incorporated recently to take over an old plant manufacturing oil well drilling and finishing tools, and does not anticipate any new construction.

The firm of Krumhaar & Aiken, New Orleans, was dissolved June 1, Mr. Krumhaar continuing the machinery business. Mr. Aiken, together with J. D. O'Reilley, will engage in the general engineering business, with offices in the Wells-Fargo building, New Orleans.

Edlin & Quist Co., Worcester, Mass., forgings, whose incorporation was recently noted, advises that it is intended to continue the business of Edlin & Quist, which was principally heavy forgings. At present, the company is adding one hammer with the necessary equipment, and plans still further enlargements.

The Heine Safety Boiler Co., St. Louis, advises that while the grading on its property where it contemplates erecting a new shop is in progress, the date when actual construction will begin is indefinite. As a matter of fact, it has not been actually decided that it will proceed at once with the work, although detailed plans are in course of preparation.

The Wausau Iron Works, Wausau, Wis., was recently incorporated by A. C. Heinzen, Henry Ellenbecker and F. W. Krause, with $25,000 capital stock to purchase the plant and business of the Northern Boiler & Structural Iron Works in West Wausau. The Wausau works was one of two plants owned by the Northern company, the other plant being located at Appleton, Wis. A. C. Heinzel was president and general manager of the Northern company.

The Poughkeepsie Foundry & Machine Co., Poughkeepsie, N. Y., iron founder and machinist, writes that the recent increase in the capital stock was not intended to make any further additions, but was to enable the company to handle more conveniently its largely increasing business, and to finance improvements already made. The plant is a comparatively new one, and it is not anticipated that there will be any changes made in the near future.

The plant of the Kemerer Steel & Iron Co., Scranton, Pa., was recently sold at public sale by the receiver. It was purchased by the Scranton Trust Co. for $94,000, to be held in trust for the bondholders, the actual purchasers. The idea of the bond-

holders is to sell the property at a favorable price, but so far there is no buyer in sight. The sale did not benefit the creditors, who have claims amounting to $30,000, as the bondholders have first claim.

A motion was recently filed in the case of the National Steel & Wire Co. vs. the National Steel Foundry Co., New Haven, Conn., for an order to pay a preliminary dividend to the general creditors of the National Steel Foundry Co. of 21 per cent. This is to be paid under an agreement whereby the general creditors are to take 75 per cent in full payment of their claim before the National Steel & Wire Co. (the holding company) takes anything. The entire matter is now in the bankruptcy court except $20,000 on attachments.

The shareholders of the recently organized Reid Foundry & Machine Co., Ingersoll, Ont., chose the following directors: David Reid, John A. McCullough, Allan H. Marshall. Mr. Reid was chosen president and general manager; Mr. Marshall, vice president; and Mr. McCullough, secretary. The company has recently acquired a site at Ingersoll, which is being improved, and operations will be commenced at once. At the founders' convention, in Toronto, the new company had one of their Reid molding machines on exhibition.

The Southern Furnace Appliance Co., New Orleans, recently incorporated, announces that it is the exclusive dealer in several states for the sale of Swift's fire door fuel feeders, which are being manufactured by the Swift Fuel Co., Chicago. It is the intention to build the plant at New Orleans, at least for the time being.

The Baltimore Bridge Co. will shortly ship a steel bridge to Panama, to be erected for the United Fruit Co. over the Sixaola river. The bridge weighs about 1,000 tons and is about 1,000 feet long, the center span being 450 feet.

The Dickson Car Wheel Co., manufacturer of chilled car wheels, general founder and machinist, Houston, Tex., advises respecting the recent fire that no plans have been made for rebuilding that part of the plant. Several years ago the company purchased 10 acres of land in a different location, which afforded ample room for growth, and last year completed a modern fireproof car wheel foundry and moved its equipment from the old location. This was not affected by the late fire. As soon as insurance adjustment has been disposed of, further plans will be taken up.

The Michigan Machine & Engine Co., Detroit, announces that practically $400,000 of the $500,000 capital stock has been subscribed, and that it will soon begin manufacture under patents of its president, Ira W. Abbott. The first factory will be in the building formerly occupied by the Reliance Motor Car Co., Champlain street and the Boulevard, which will be leased. The chief article of manufacture will be a rotary steam engine and turbine. For the most part the shares are being taken by Detroit capitalists. The other officers of the company are, secretary and treasurer, C. H. Nixon, and general manager, Charles E. Wain.

The Denton Woven Wire Fence Co., Denton, Tex., advises that it was recently incorporated to carry on the manufacture already undertaken of farm and field fencing. Its output is now about three cars per week, and the company expects to add more looms in the fall. The factory building at present is complete, and the company plans to add a machine shop in the near future. The officers of the company are: President, G. H. Blewett; vice president, W. V. McClurkan, and secretary, L. G. Fry.

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**Fires:—**

The storage house of the Warren Foundry & Machine Co., Phillipsburg, N. J., was damaged to the extent of $3,000, June 23.

The plant and offices of the Richmond Stove Co., Richmond, Va., sustained a loss of about $150,000, partially insured, June 17.

The loss on the plant of the American & British Mfg. Co., Providence, R. I., has been placed at 50 per cent of the $550,000 insurance.

The foundry of the Lakeside Foundry Co., Muskegon, Mich., was damaged to the extent of about $1,500, June 7, by a fire which started near the cupola.

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**Trade Notes:—**

The Filer & Stowell Co., Milwaukee, builder of high grade, heavy duty Corliss engines, is again represented in Chicago and its vicinity by Frank Engelhardt, with office at 735 Marquette building. Mr. Engelhardt, with the exception of a short period, has been handling the Filer & Stowell engines for about 10 years.

The Wm. B. Scaife & Sons Co., Pittsburg, has moved its New York office to the Havemeyer building, 26 Cortlandt street. H. F. Reynolds is in charge and will give attention to the line of structural steel work, steel tanks and barrels, water filters, and water softening apparatus.

## TRADE PUBLICATIONS.

VALVES.—The Crosby Steam Gage & Valve Co., Chicago, is issuing a booklet pertaining to the Branden patent pump valve with wire coil insertion, enumerating its many advantages and describing it thoroughly.

REAMERS.—The Cleveland Twist Drill Co., Cleveland, is sending out catalog 33 on Paradox adjustable reamers, combining rigidity, simple construction, easily adjusted blades, etc. The catalog gives a detailed description of the reamers and a number of tables of dimensions and price lists.

BOILERS.—The Traylor Engineering Co., 2 Rector street, New York City. The Hawkes boiler is described in a 6 x 9-inch, 20-page catalog issued by the above company, detailing its circulation, efficiency, construction, setting, accessibility, etc., and describing its various parts. The illustrations include views showing the construction of the boiler, with the upper shell covered, completed setting without covering to upper shell, horsepower units, jacketed casing, boilers under construction, travel of gases, etc.

TURBINE BOILER TUBE CLEANERS.—The Lagonda Mfg. Co., Springfield, O. 36 pages. Catalog G, introducing the new wing head cleaner manufactured by the above company and briefly describing the Weinland turbine and mechanical tube cleaners; the Lagonda reseating machine for cleaning nuts, headers and caps of B. & W. and similar boilers; the Lagonda boiler tube cutter and the Lagonda automatic cut-off valve.

RECORDERS.—The Bristol Co., Waterbury, Conn. Bulletin Number Forty-One, illustrative and descriptive of Bristol recording instruments, comprising voltmeters, ammeters, wattmeters, gages, thermometers, etc. Some of the advantages claimed for these recorders include simplicity, durability, ease of operation and great variety. They are constructed without gears, levers, relays or any fragile multiplying devices.

PULLEYS.—The Oneida Steel Pulley Co., Oneida, N. Y. General catalog No. 3. 121 pages. 6 x 9 inches. Steel, wood and combination pulleys, ball bearings, belting, hangers, clutches, couplings, pulley stands, floor stands, base plates, bolts, bushings, traction wheels, turn buckles, babbitt metal, shafting, etc., are all described and numerously illustrated. Tables of weights, dimensions and horsepower are given and price lists are presented.

THERMIT WELDING PROCESS.—The Goldschmidt Thermit Co., 90 West street, New York City. 11 pages. 6 x 9 inches, entitled "Butt-Welding Wrought Iron and Steel and Pipes and Rods by the Thermit Process." This process provides a means of joining wrought iron or steel sections anywhere in place without machinery, furnace, electric power or hammering, and is especially valuable for welding pipe coils in one piece. The catalog shows that tubes for steam pressure, deep well lining, hydraulic work, compressed air for ammonia (gas or liquid) can be butt-welded; also rods, bars, etc. A description of the various operations in this process and the necessary equipment are given; also price lists of pipe and appliances.

STEAM SPECIALTIES.—The Wright Mfg. Co., Detroit. Catalog No. 11. 43 pages. 6 x 9 inches. Among the articles manufactured by the above company which are described and illustrated in the catalog are the Wright improvel safety alarm water column; weighted regrinding gage cock; steam trap; "cyclone" exhaust heads; filters; separating tanks; scale separators, for use on steam or water systems, etc. Price lists and testimonials are also given.